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GRAY'S ANATOMY
1850

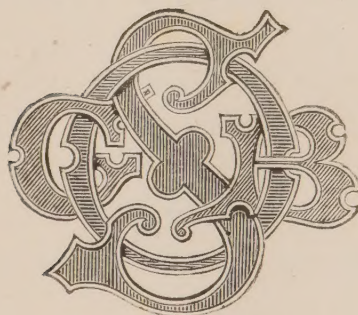
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TRANSACTIONS
OF THE
ODONTOLOGICAL SOCIETY
OF
GREAT BRITAIN.



VOLUME V.—NEW SERIES.

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1873.

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GENERAL MONTHLY MEETING,

Monday, November 4, 1872.

THOMAS UNDERWOOD, ESQ., PRESIDENT, IN THE CHAIR.

THE Minutes of the last Meeting were read and confirmed.

Mr. HENRY MARSH, L.D.S., 198, Oxford Road, Manchester, was elected a non-resident Member of the Society.

The following gentlemen were recommended by the Council for election as Honorary Members of the Society :—

Mr. J. T. CLOVER, F.R.C.S., 3, Cavendish Place, Cavendish Square.

Mr. F. WOODHOUSE BRAINE, F.R.C.S., 56, Maddox Street, Bond Street.

Mr. G. H. BAILEY, M.R.C.S., 25, Charles Street, Middlesex Hospital.

Mr. TOLLEMACHE BULL, 60, Welbeck Street, Cavendish Square, was proposed as a resident, and

Mr. W. BEADELL BACON, Tunbridge Wells, as a non-resident member of the Society.

The following donations to the Library were announced :—

Calendar of the Royal College of Surgeons.

Mr. HITCHCOCK of Boston,—Wedl's "Pathology of the Teeth," and O. Wendell Holmes's "Claims of Dentistry."

Dr. E. MAGITOT, Paris,—"The Works of Dr. P. Magitot."

The Curator reported the following donations to the Museum :—

The receipt of the following, from Mr. EDEN, of Brisbane, announced at the last Meeting :—

Skull of *Phascolarctos Cinereus*.

„ „ *Halmaturus Thetidis*.

„ „ *Halmaturus Mastersii*.

„ „ *Phalangista Cookii*.

„ „ *Phalangista Vulpina*.

„ „ *Bettongia Graii*.

„ „ *Halmaturus Ualabatos*.

„ „ *Petaurista Taguanoides*.

„ „ native Dingo.

From W. T. PELLOW, Esq., of Southampton.—A bone piece greatly affected with caries.

From R. HEPBURN, Esq.—A number of bone pieces affected with caries.

From F. RICHARDSON, Esq., of Derby, and from W. F. FORSYTH, Esq.—Bone pieces affected with caries.

From C. SIMS, Esq., Birmingham.—Four bone pieces with natural teeth affected by caries, and nine of the earliest porcelain teeth.

From P. CAFFERATA, Esq., Sunderland.—Two natural teeth inserted on pivots, an interstitial carious cavity in one of them.

From C. ROGERS, Esq.—Old bone pieces.

From W. STARR WHATFORD, Esq.—Three bone pieces affected with caries; secondary dentine deposited behind an amalgam-filling; a mis-shapen tooth (bicuspid and molar); curiously-shaped supernumerary tooth; a lower molar, to which is united a portion of fang of another tooth; a bicuspid and molar, with a portion of alveolar plate broken away by a key instrument; an upper molar with fangs almost completely absorbed; a large mass of tartar; an upper molar with an accessory fang.

Mr. C. J. Fox stated that he had been requested by Mr. Fletcher, of Warrington, to bring before the notice of the Society a new gum, resembling somewhat gutta-percha in its nature. Mr. Fletcher thought it appeared likely to prove an important addition to the substances employed for dental purposes. It was of a dull amber-colour. When heated, it could be welded or moulded with the greatest ease ; when cold, it became perfectly tough and strong. It took a splendid impression of the mouth, without twisting or warping like gutta-percha. Unlike that substance, also, it did not decompose from exposure to weather. When pure it resisted perfectly the action of hydrochloric acid. Mr. Fletcher hoped soon to receive a much larger quantity of the gum upon which to experiment. A small sample was handed round the Meeting.

Mr. C. J. Fox reported the case of a gentleman seventy-eight years of age who had not lost a single tooth, but possessed the whole thirty-two. The gentleman informed him that, twenty years since, some two or three of them had been filled. As Mr. Fox only found one, a gold filling, he concluded, if the patient were correct, the others must have been small fillings in the masticating surfaces which had been worn away with the crowns of the teeth.

The PRESIDENT said he recollected a case to which he was called in, where the patient, aged ninety-four years, believed he was cutting some teeth which interfered with the use of a set of teeth he was wearing. His ordinary medical man thought such a thing impossible, and asked his, the President's, attendance, when he found the patient was actually cutting the two wisdom teeth of the upper jaw.

Mr. CLOVER exhibited an apparatus to be employed in the administration of ether or chloroform, in cases where, from idiosyncrasy, the patient objected to anything touching the nose and mouth. It consisted of a flexible frame covered by a curtain of thin air-proof silk, which was passed over the head of the patient, and was secured about the neck. In front, the place of the silk was substituted by an oval glass about eight

inches in length, which allowed the patient to look about him, and the operator to watch the countenance of the patient.

Mr. COLEMAN asked Mr. Clover if he had used this apparatus with nitrous oxide. He (Mr. Coleman) had long wished to try the effect of an apparatus similar to that exhibited by Mr. Clover, which could easily be so constructed as to admit the introduction of an instrument whilst the patient's head was surrounded with an atmosphere of nitrous oxide, the object of such an arrangement being, of course, the keeping up the anæsthesia during the operation.

Mr. CLOVER said he had not so used his appliance, but he saw no reason why it should not, if slightly modified, be employed in the manner suggested by Mr. Coleman.

The President then called upon Mr. Gascoigne Palmer to read his Paper.

An Atmosphere of Nitrous Oxide. By T. W.

GASCOIGNE PALMER.

MR. PRESIDENT AND GENTLEMEN,—

I HAVE no doubt whatever that a real atmosphere of pure protoxide of nitrogen would be the best way of obtaining the most perfect anæsthetic results with this most useful and efficient agent for rendering painful dental operations painless; but as the obtaining of this would be most costly and almost impracticable, it is my purpose to put before the members of this Society a method of gaining a near approach to it which I have adopted since October, 1871.

Before proceeding further I would wish to say how much diffidence I feel, as a young provincial practitioner, in reading a Paper before this learned Society, composed as it is of so many of my seniors and metropolitan brethren, on a subject which is so well understood as the administration of the protoxide of nitrogen. But I hope that if I tell many nothing more than they already know, they will pardon me if I succeed either in telling others things which may have escaped their attention, or in producing discussion on a subject in which I feel great interest; for I can think of nothing that is more likely to be beneficial to our, or any other profession,

than many thoughtful opinions expressed on the same subject.

It will be my endeavour this evening to speak of nothing but the best plan that I know of for administering the gas, keeping from all allusion to its chemical properties and physiological action; in fact simply explaining a mode in which I have been using the gas for over a year, with results far better and more satisfactory than I had obtained up to the time of adopting it.

The idea of an atmosphere of nitrous oxide originated, as far as I know, with my friend Mr. Warwick Hele, of Carlisle, and he first mentioned it to me in a letter some eighteen months ago. When in Carlisle in August, 1871, he showed me an arrangement which he had invented for producing an atmosphere of nitrous oxide, similar to the one which I have used since October 14, 1871, and which it will be my pleasing duty this evening to describe, adding to the description the excellent results which I have obtained since adopting his plan.

Mr. Hele's idea was that the pressure of the gas supplied to a patient inhaling should be as nearly as possible equivalent to the pressure of the air.

I will first explain his arrangement, then the manner in which it works, concluding this paper with its advantages. It consists of a gasholder, and composite tubing $\frac{5}{8}$ ths of an inch in diameter inside measure, leading from the gasholder to the

operating-room. I feel sure now that tubing $\frac{1}{4}$ of an inch in diameter would do equally well, as, no matter at what distance the gasholder is from the operating-room, Mr. Hele's plan is certain to provide an ample supply of gas.

Where the metal tube enters the operating-room there is attached to it a piece of flexible tubing of sufficient length to reach the operating-chair, and into the extremity of this, nearest the chair, is inserted one end of a T-jointed brass tube, the opposite end being inserted in a piece of flexible tubing of not less than $\frac{7}{8}$ ths of an inch in internal diameter, in the manner that the one I now show you is done. To the third opening of the T tube is attached what I will call Mr. Hele's storing-bag.

It is of consequence that the tube leading from this bag to the patient should not be less than $\frac{7}{8}$ ths of an inch in internal diameter, and not of greater length than two feet. To the other end of this tube is attached Mr. Clover's two-wayed stopcock.

We will now imagine that a patient is in the chair ready to have the gas administered.

I open Mr. Clover's two-wayed stopcock, and also the tap of Mr. Hele's storing-bag, and squeeze the bag as free of all air as possible. I now close the tap of the storing-bag, and also Mr. Clover's tap. I signal to an assistant to turn on the gas from the gasholder, the pressure of gas from the gasholder being determined by the distance it has

to come, and the size of the tube it has to come through. I now open the tap of the storing-bag and Mr. Clover's two-wayed stopcock simultaneously, holding an ember to the opening of the latter. As soon as the ember bursts into flame, I shut Mr. Hele's tap and then Mr. Clover's. I now attach Mr. Clover's face-piece, and all is ready to begin.

I fit the face-piece carefully over the nose and mouth of the patient, tell him to make one long inhalation and exhalation, turn on Mr. Clover's tap and directly afterwards the tap of the storing-bag, telling the patient to breathe as quietly as possible; at the end of 40 seconds I open Mr. Clover's supplemental bag, and during the whole administration do not close the exhaling-valve of the face-piece at all.

We must now notice the action of the storing-bag.

As the patient inhales, the bag collapses, sometimes to such an extent as to become *almost* empty; as the patient exhales, the gas, coming with a constant flow from the gasholder, collects in it, ready for the next inhalation; thus the valves of Mr. Clover's face-piece work quite independently of the pressure of gas from the gas-holder, governed only by the breathing of the patient.

The patient has always a plentiful supply of gas, which prevents to a great extent the

danger of air being drawn in between the cushions of the face-piece and the face; more gas than is required does not come into the face-piece, thereby preventing waste.

Beyond this I find the following advantages. Much comfort to patients, there being an absence of all struggling, and no complaints of feeling suffocated.

The patient also appears, in going off and coming to, more as though he were going to and waking from sleep.

There is, moreover, nothing like that blueness of complexion that is so well known, and which I have found often produces much alarm with persons watching the administration.

I find that in 100 registered cases immediately preceding the use of Mr. Hele's storing-bag, the time occupied in producing anæsthesia was on an average 78". In these cases the gas was given from an Indianette bag, or from the gasholder direct.

In 100 registered cases immediately succeeding the use of Mr. Hele's bag the average period for producing anæsthesia was 66". In these cases Mr. Hele's bag was used at every administration.

The 200 cases I have just mentioned are taken from my register-book in the order in which they are entered.

In using the Indianette bag at least six gallons of gas were used or wasted per patient.

In giving the gas direct from the gasholder, five gallons were consumed by each patient.

With Mr. Hele's bag $3\frac{1}{2}$ gallons is the average consumption by each patient.

There is a longer period of anæsthesia resulting from its use, which I believe arises from an absence of nervousness during the period of inhalation, combined with an absence of all air from the gas inhaled.

My register-book also shows a marked difference in its column of remarks since using the storing-bag, from the fact that nearly all the cases are so much alike that there is nothing to comment on.

Mr. Hele, since inventing the storing-bag, has invented an instrument which he calls a nitrous oxide governor, with which he tells me he has obtained better results than with the bag arrangement; but as I have no personal experience of its working, I will only now say of it that I think it is a most clever and scientific instrument, and that I hope it will some day form the subject of a paper to be read before this Society.

In conclusion, I beg to say that it will be a great pleasure to me if I have succeeded in bringing before you a simple and easily-understood paper, one that may give useful hints for future working out by my brethren in the profession, and one that may be the means of adding to the comfort of their patients.

PROTOXIDE OF NITROGEN AS AN ANÆSTHETIC.

The PRESIDENT said it would doubtless be in the recollection of most now present that in March, 1868, nitrous oxide was first employed successfully for dental operations in this country, by Dr. Evans, of Paris, in the Hospital attached to this building, and that the same gentleman handed over to its Committee the sum of £100 for the purpose of investigating its merits as an anæsthetic. To this end a joint Committee was appointed, by that Committee and this Society, who laid before them a preliminary Report on the 7th of December, 1868. That preliminary Report was, he believed, considered, according to the amount of experience the Committee possessed at that time, highly satisfactory. Now, after much more extended experience of the use of the agent, and after the acquirement of more knowledge respecting it, the result of experiments upon the lower animals, that Committee had concluded their no very easy task, and had placed in his hands their final Report, which he would call upon their Chairman, Mr. Harrison, to read.

Mr. HARRISON then read the following Report :—

SECOND REPORT of the Joint Committee appointed by the Odontological Society of Great Britain, and the Committee of Management of the Dental Hospital of London, to inquire into the “ Value and Advantages of the Protoxide of Nitrogen as an Anæsthetic in Surgical Operations.”

IN presenting their second and final Report on the effects of the protoxide of nitrogen as an anæsthetic, your Committee think it right, in the

first place, to give some explanation of the causes which have led them to delay doing so thus long, which they may briefly say have been the difficulty of following out and arriving at any conclusions on certain points to which they were requested to direct their attention, and the necessity of allowing time for prolonged experience on others.

It will be in the recollection of the Society that the points to which the attention of your Committee was to be more especially directed previous to the production of their second Report, were :—

1st. To ascertain, if possible, in what manner, looking at the subject physiologically, this agent produced its anæsthetic effect ; and, should they come to any conclusion on this point, to found thereon the plan of treatment which, in their opinion, would be most likely to be attended with beneficial results, in the event of alarming symptoms supervening during its administration.

2nd. To devise, if possible, some mode of prolonging its anæsthetic effects.

3rd. To collect all the further information they could as to the best mode of preparing, storing, and administering this gas, any anomalous effects it might produce in exceptional cases, and the best mode of meeting these effects should they call for any special treatment.

Lastly. To bring forward any additional information respecting it, which further experiments and observations might enable them to do, on points not touched upon in their former Report.

Your Committee, bearing in mind these points, proceeded in the first instance to institute certain experiments to ascertain, if possible, the physio-

logical action of this gas; but were met with difficulties which they found would render it impossible for them to carry out these experiments with any prospect of success in their collective capacity, not having at their command the apparatus necessary for the purpose. They therefore requested three of their number, viz., Dr. Frankland, Mr. Coleman, and Mr. Braine, to institute certain experiments individually; and these gentlemen having kindly undertaken the duty, your Committee have now the pleasure of bringing before the Society the results of the experiments of the first two, and the conclusions they arrived at. The third, Mr. Braine, requests your Committee to express his regret that he cannot allow his experiments and their results to be brought before the Society at present, as they have not yet been sufficiently carried out to enable him to arrive at any definite conclusions from them.

The following is a statement of Dr. Frankland's experiments and conclusions:—

“ROYAL COLLEGE OF CHEMISTRY,
22nd August, 1870.

“GENTLEMEN,—I have now the honour to submit to you the results of my experiments made to ascertain whether nitrous oxide is decomposed when it is respired.

“These experiments were made with a young and tame rabbit, weighing 527 grammes. It was placed upon an air-pump plate, and covered with a tubulated receiver as small as was compatible with the comfort and free motion of the animal. Communicating with this receiver were two very

wide tubes, through which a very large volume of gas could be passed, so as to completely change the gaseous contents of the receiver in a few seconds. By means of properly regulated valves, one of these tubes could be put in communication with either a large gasholder of oxygen or one of nitrous oxide; the other tube allowed gas to escape from the receiver, and its open extremity was immersed in water to the depth of a few millimètres.

“First Experiment.”

“This experiment was commenced by passing a rapid current of oxygen through the receiver containing the rabbit. At first the animal remained quiet, but after five minutes he began to move about, and put out his tongue rapidly and frequently. He then sat upon his haunches, washed his face, and appeared quite comfortable. For the first few minutes respiration was hurried, but it soon became slower. After he had been in the stream of oxygen for thirty-four minutes, respiration was slow, but slightly laboured.

“The oxygen was now rapidly replaced by nitrous oxide; within two minutes from the time the latter gas began to be admitted, breathing entirely ceased, and the animal fell apparently dead, without much previous excitement. One minute later, he was removed from the receiver; and, with the help of artificial respiration, recovered in three minutes.

“It was obvious that an experiment of this kind could not be successfully employed for the solution of the problem proposed, as the period of respiration in the nitrous oxide was far too short to produce a change in the composition of the gas sufficient to be determined with certainty by analysis. I therefore endeavoured to make such a mixture of oxygen and nitrous oxide as could be inhaled for a considerable length of time. Preliminary experiments showed that a mixture consisting of about one part of nitrous oxide and nine parts of oxygen was well adapted for the purpose, as the rabbit could not only breathe this mixture apparently for any length of time without inconvenience, but continue to exist for more than half an hour in the small receiver without any renewal of its gaseous contents. Under such conditions, any marked decomposition of nitrous oxide could not fail to be analytically detected.

“In practice, it was found impossible to employ in these experiments gases free from elementary nitrogen. The apparatus and manipulations necessary in the preparation of these gases, on the large scale, always introduced into them a considerable volume of atmospheric air, as will be seen from the subjoined analyses of the gaseous mixture used.

“Second Experiment.

“In this experiment the disposition of the apparatus was the same as before, with the addition of a Sprengel pump, so arranged as to admit of the withdrawal of samples of gas from the interior of the receiver during the progress of the experiments. The rabbit having been placed in the receiver, a rapid stream of oxygen was passed through the latter for eight minutes, so as to expel atmospheric air. The oxygen was now rapidly displaced by the gaseous mixture above mentioned, and the current then stopped. The rabbit became a little more lively than usual, but otherwise exhibited no particular symptoms; its breathing was natural, and it appeared to be quite comfortable. Samples of gas were withdrawn for analysis at the end of six minutes, twenty-three minutes, and twenty-nine minutes. At this time breathing became laboured, but there was no coma, and the animal continued to sit upon its haunches. At the end of half an hour it was removed from the receiver.

“Submitted to analysis, the samples of gas gave the following results :—

	Gas supplied to Receiver.	After respiration for 6 Minutes.	After respiration for 23 Minutes.	After respiration for 29 Minutes.
Nitrogen	10·8	9·6	9·6	9·0
Nitrous oxide..	8·3	9·9	10·1	10·6
Oxygen	80·8	79·8	74·6	72·1
Carbonic acid..	·1	·7	5·7	8·3
	100·0	100·0	100·0	100·0

“Third Experiment.

“In this experiment, which was conducted like the last, the animal was first made to breathe the mixture of nitrous oxide, nitrogen, and oxygen for half an hour ; the receiver was then thoroughly cleared out by a rapid current of the same gas, and, the gaseous contents of the receiver being isolated as before, the series of observations commenced. Before the change of gas, the animal had become uneasy, and breathed laboriously ; after the change, he lay down against the glass, and was quiet, the eyes were open, and the breathing was natural. Five minutes afterwards he breathed slowly, and appeared somewhat comatose ; but a few minutes later he washed his face, became lively, and continued so for seventeen minutes longer, when breathing became hurried and laboured, and so remained up to the close of the experiment. A few minutes in the air, however, restored him to perfect health.

“Samples of gas were withdrawn for analysis, as before, after the animal had been confined in the unchanged gas for eighteen minutes, twenty-nine minutes, and thirty-three minutes.

“Submitted to analysis, these samples and the original gas supplied to the receiver gave the following results :—

	Gas supplied to Receiver.	After respiration for 18 Minutes.	After respiration for 29 Minutes.	After respiration for 33 Minutes.
Nitrogen	7·8	7·4	7·4	7·2
Nitrous oxide..	10·1	10·8	10·8	11·2
Oxygen	81·8	76·4	73·6	73·0
Carbonic acid..	·3	5·4	8·2	8·6
	100·0	100·0	100·0	100·0

“The problem the solution of which is attempted in the foregoing experiments is surrounded with greater difficulties than are at first apparent. The difficulties arise, firstly, from the impossibility of employing pure nitrous oxide gas for respiration, owing to the very short time during which respiration can be carried on in the undiluted gas ; secondly, from the practical

impossibility (with the means at my disposal at least) of employing pure oxygen,—that is, oxygen free from all admixture of nitrogen,—for the dilution of the nitrous oxide; and, thirdly, from the great difficulty, not to say impossibility, of accurately measuring the volume of gas before and after the use for respiration.

“It is evident that if pure nitrous oxide could be employed, and the animal experimented upon be allowed to wash out its lungs, as it were, in a stream of the gas for some time before the commencement of the actual experiment, the answer to the question would be obtained with the greatest facility; for the presence of free nitrogen in the products of respiration would then prove that decomposition of the nitrous oxide had taken place, whilst its absence would show either that no decomposition had occurred or that free nitrogen was not one of the products of decomposition. Again, if a mixture of oxygen and nitrous oxide from which free nitrogen was rigidly excluded could be employed, then the appearance or non-appearance of free nitrogen in the products of respiration would have the same signification as before. Lastly, if a known volume of a mixture of oxygen and nitrous oxide containing a known proportion of free nitrogen could be employed in a respiration experiment, and the volume of the resulting gases be also accurately determined, together with the proportion of free nitrogen, the increase or otherwise of free nitrogen would be indicative of the same conclusions as before. It is obvious, however, that without such a determination of the absolute volume of gas before and after the experiment, no perfectly trustworthy conclusions can be drawn from the mere *per-centage* composition of the gas before and after respiration, because there is no fixed volumetric standard of comparison. It is obvious that the oxygen cannot be used as such a standard, since it is absorbed by the animal, and transformed partly into carbonic acid and partly into water: consequently, the united volumes of oxygen and carbonic acid do not remain unchanged during the experiment. And it is equally obvious that neither the volume of nitrous oxide nor that of free nitrogen can be used for this purpose, because the problem to be solved is involved in such an assumption.

“Although, therefore, the above experiments do not admit of being used for the absolute solution of the problem proposed, nevertheless, as the observation of a manometer showed that the gases suffered but a very small diminution of volume during respiration, the results may be safely taken as proving that *not more than a very small proportion of nitrous oxide, if any, was decomposed*, since the per-centage proportion of this gas underwent no diminution during the progress of respiration.

“With the same reservation, these experiments also show, as subsidiary or collateral results :—

“1. That the united volumes of oxygen and carbonic acid underwent but a very slight diminution, indicating that nearly the whole of the oxygen absorbed by the animal was employed in the oxidation of carbon. Thus in the second experiment we have :—

	Per-centage Volume.
Oxygen and carbonic acid in gas supplied to the animal	80·9
Ditto, after being respired for 6 minutes	80·5
“ “ “ 23 “	80·3
“ “ “ 29 “	80·4

“And in the third experiment :—

	Per-centage Volume.
Oxygen and carbonic acid in gas supplied to the animal	82·1
Ditto, after respiration for 18 minutes	81·8
“ “ “ 29 “	81·8
“ “ “ 33 “	81·6

“2. That the united volumes of nitrogen and nitrous oxide suffered a corresponding slight augmentation. Thus, in the second experiment :—

	Per-centage Volume.
Nitrogen and nitrous oxide in gas supplied to the animal	19·1
Ditto, after being respired for 6 minutes	19·5
“ “ “ 23 “	19·7
“ “ “ 29 “	19·6

“And in the third experiment :—

	Per-centage Volume.
Nitrogen and nitrous oxide supplied	17·9
Ditto, after being respired for 18 minutes	18·2
„ „ „ 29 „	18·2
„ „ „ 33 „	18·4

“3. That the volume of nitrogen in the mixed gases experienced an apparent slight reduction during their use in respiration, whilst that of nitrous oxide suffered a slightly greater increase. These results, if proved, would be exceedingly remarkable, but I do not consider that the experiments establish either of them : first, because the analysis of gaseous mixtures containing nitrogen and nitrous oxide is one of the most difficult operations in eudiometry, and the results, even of the most carefully-executed analyses are by no means so exact as those of nearly all other eudiometrical determinations; and, secondly, because the gaseous products of the decomposition of food in the intestinal canal of the rabbit might interfere with the results of the analyses, so far as to cause an apparent slight increase of nitrous oxide, and corresponding decrease of nitrogen. These variations must be considered as within the limits of experimental error.

“In conclusion, I have to acknowledge the courtesy of Messrs. Bell & Co., of Oxford Street, who kindly placed at my disposal an unlimited supply of nitrous oxide gas for this inquiry.

“I am, Gentlemen,

“Your obedient Servant,

“E. FRANKLAND.

“The NITROUS OXIDE COMMITTEE.”

In a letter which accompanied the foregoing valuable communication from Dr. Frankland, he

makes the following additional observations, which your Committee consider of too much value to be omitted from this Report. They, therefore, with his permission, add them:—

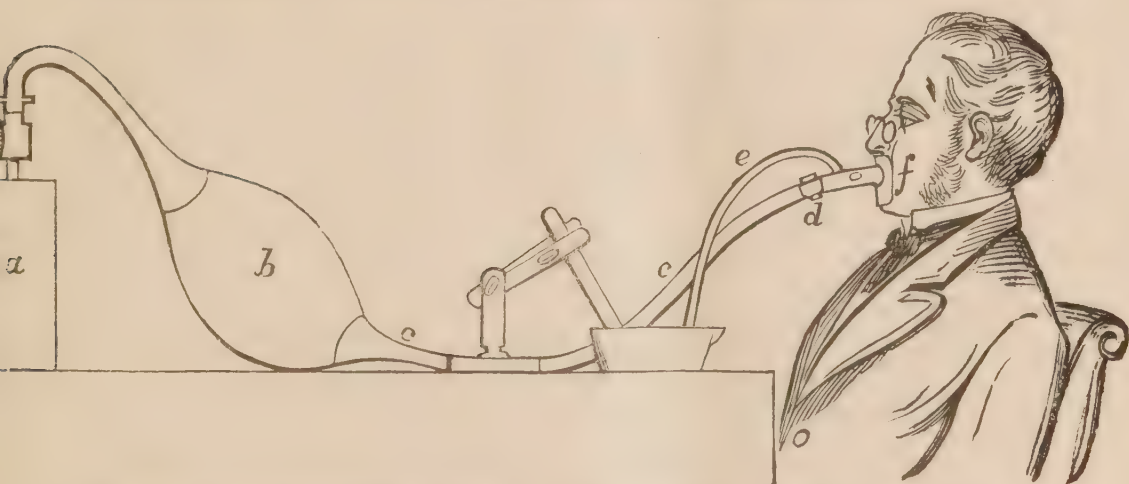
“I have found the investigation which you requested me to make much more difficult than I had anticipated, not indeed as regards the physiological part of the experiments, which was made as long ago as January last, but as regards the subsequent analytical determinations, which have presented such difficulties that even a month ago I despaired of overcoming them. Such a gaseous mixture had never before, in all probability, been submitted to accurate analysis, and the separation of nitrogen and nitrous oxide presented quite unlooked-for obstacles, since their explosion with excess of hydrogen, instead of liberating free nitrogen from the nitrous oxide, as is commonly supposed, gives rise to the formation of nitrous acid, and ammonia likewise. At last I overcame the difficulty by using a very large excess of hydrogen, and exploding under reduced pressure; but even now the results are not so sharp as I could wish. Still they prove that not more than traces of nitrous oxide can be decomposed during respiration. It is true that this result was obtained with mixtures of nitrogen, oxygen, and nitrous oxide much richer in oxygen than atmospheric air, and it may perhaps be contended that a different result might be obtained if the nitrous oxide were breathed either alone or mixed only with air; but I do not think it likely that an effect which would be produced under the conditions just mentioned would cease altogether, or nearly so, when a larger percentage of oxygen was present. For the reason mentioned in the report, it was hopeless to attempt to operate with nitrous oxide alone, neither could any mixture of this gas with atmospheric air have been successfully employed, owing to the rapid effects of carbonic acid in such a mixture, and the large proportion of free nitrogen in the initial gas. There was no excitement whatever in the mixture of O and O N₂, and consequently the experiment was quite under control.”

The following are Mr. Coleman's experiments and conclusions :—

“To the CHAIRMAN OF THE COMMITTEE APPOINTED TO INVESTIGATE THE MERITS OF NITROUS OXIDE AS AN ANÆSTHETIC.

“SIR,—I now hand you the results of some experiments undertaken at the request of the above Committee, in order to determine the question as to whether nitrous oxide be or be not decomposed when respired.

“The experiments were carried out in the following manner :—The gas, which was in the compressed state, and supplied by the Messrs. Barth, was first analyzed. The next proceeding was to collect the products of respiration obtained at a first and a third expiration ; the lungs having, previously to the first inspiration, been forcibly emptied to the fullest extent. For this purpose, the following apparatus was employed :—



a, bottle of compressed gas. *b*, thick india-rubber bag. *c c*, tube leading from bag to mouthpiece. *d*, stopcock, having valve to prevent return to bag. *e*, glass tube conveying results of respiration to receiver in mercury bath. *f*, mouthpiece, with expiratory valve in front of it : when the products of expiration are collected through tube *e*, the valve is closed.

“In commencing the experiments, after having carefully ascertained that all the unions were perfectly air-tight, gas was allowed to enter into the bag from the bottle, and drawn through the bag and tubes to ensure the removal from them of

all air they previously contained. The nostrils of the individual having been securely closed with a spring clip, the face-piece was applied, and the lungs being emptied to the greatest extent, the gas was turned on at the stopcock, when a full inspiration was taken. After holding the gas about three seconds in the lungs, it was expired, and some of the latter portions of it collected over mercury. Two more equally deep inspirations of the gas were taken, and some of the products of the third expiration collected, when the individual was becoming, or occasionally had become, unconscious; the previous emptying of the lungs, and the deep and deliberate inspirations taking early effect.

“Analysis of the Gas employed.

Carbonic acid	.....	0·103 per cent.
Oxygen	.....	1·540 ,,
Nitrogen	.....	6·160 ,,
Nitrous oxide	.....	92·197 ,,

“At the time these experiments were carried out the gas in the liquid form was not obtainable; otherwise, this would have been employed, as containing less air mixed with it.

“Mean Results of several Analyses of Gases collected after One Respiration.

Carbonic acid	.....	3·187 per cent.
Oxygen	.....	2·700 ,,
Nitrogen	.....	17·854 ,,
Nitrous oxide	.....	76·259 ,,

“Mean Results of several Analyses of Gases collected from a Third Expiration.

Carbonic acid	.....	2·346 per cent.
Oxygen	.....	1·621 ,,
Nitrogen	.....	17·100 ,,
Nitrous oxide	.....	78·933 ,,

“The results of these analyses upon the whole show that, if nitrous oxide gas be at all decomposed in the blood, it must be

only in very small quantities. The results of the last analyses, in containing a larger proportion of nitrogen than we should have expected, appear to favour the view that it is decomposed ; but, on the other hand, the uniform decrease in the amount of carbonic acid as respiration of the gas progresses is a strong contradiction to that assumption.

“The large per-centages of oxygen and nitrogen in the expired gases are obtained, of course, from the residual air which cannot be expelled from the lungs by a forced expiration, and which has been vaguely estimated at from 40 to 260 cubic inches.

“The variations in the several analyses consisted chiefly in the relative amounts of oxygen and nitrogen in each, which were due to the circumstance of the individual not always emptying the lungs of air, and filling them with gas, to the same extent.

“Independently of the above, the following objections may be urged against the view that nitrous oxide is decomposed in the blood :—

“1. The stability of the compound, it not being decomposed by the ordinary deoxidizing agent.

“2. The fact that when breathed, the quantity of the exhaled gases is much smaller than the quantity inhaled, which would not be the case were it decomposed in the lungs or blood-vessels ; for nitrous oxide, being composed of two volumes of nitrogen, combined with one volume of oxygen, but occupying only the space of two volumes, any abstraction of oxygen would not be attended with any diminution of bulk.

“3. If nitrous oxide be decomposed in the blood, in what manner can the liberated nitrogen—which must assume the *gaseous* form, none, I think, will venture to dispute—effect its escape through the walls of the blood-vessels of the lungs ? Yet its presence in the blood in the form of a gas would, we know, rapidly prove fatal to the individual.

“I am, &c. &c.,

“A. COLEMAN.”

From these experiments, so scientifically and carefully conducted, the majority of your Committee are of opinion, with Dr. Frankland and Mr. Coleman, that this agent cannot produce its anæsthetic effect from being decomposed in the lungs or blood, as has been supposed by some; but are inclined to believe that it produces its effect by preventing “oxygenation of the blood,” an opinion receiving support from the fact that anæsthesia may be produced by the inhalation of such gases as hydrogen, nitrogen, carburetted hydrogen, &c. Holding this opinion, your Committee would still simply recommend, in the event of alarming symptoms supervening during the administration of this gas, that its exhibition should be immediately suspended, and artificial respiration resorted to, as recommended in their former Report, care being taken that the tongue be drawn forward in such cases, if need be, so that no impediment be offered to the free admission of air into the lungs.

As regards the question whether anæsthesia is produced by the action of the blood in its altered condition directly upon the nervous centres, or in what other way—a question which has been much mooted, and which has engaged much of the attention of your Committee—they have to report that they have not yet been able to arrive at any definite conclusion upon it.

Your Committee having now laid before the

Society all the information they have been able to collect respecting the physiological action of the protoxide of nitrogen (or, as it has been more familiarly called in the foregoing experiments, "nitrous oxide"), pass on to the other points connected with the action of this agent, to which they were requested to direct their attention, although the further experience gained on most of those points since the production of their first Report has already been made known so generally to the profession at large, through the medium of the press, that they do not deem it necessary to dwell on them at any great length.

With regard to prolonging the anæsthetic effect of this gas, so as to make it more available for operations on the mouth requiring time, or for surgical operations generally, your Committee are able to report that this has been accomplished in many ways; viz., when the operation is on the mouth, by continuing the inhalation of the gas through the nose during the operation, by means of a "nose-piece" adjusted to the gas-tube, the supply of gas being regulated according to circumstances; or by throwing a jet of gas into the mouth at each inspiration whilst the operation is proceeding, the nose, in the latter case, being closed by a spring clip; and when the operation is on any other part of the body, by checking and re-supplying the gas through the face-piece from time to time, as circumstances may require.

These processes being already well known to the profession, your Committee do not think it necessary to dwell upon them further in this Report, but, while on this point, cannot refrain from expressing their surprise and regret that this agent has not been brought into greater use for operations other than those upon the teeth, seeing that operations extending over several minutes may be thus performed under its influence; and, moreover, seeing that a large number of the fatal cases arising from the use of chloroform in the practice of general surgery, have occurred when that agent has been administered for short and even trivial operations. They would therefore strongly direct the attention of surgeons to these facts.

As regards the next questions left for their further consideration,—viz., the best mode of preparing, storing, and administering this gas, your Committee have much pleasure in being able to state that great improvements have been effected in these respects also since they put forth their former Report. The improvements in the manufacture of the gas, its introduction into use in a compressed form, first carried out so efficiently by Mr. Barth, and in its still further compressed form (the liquid) by Messrs. Coxeter & Sons, the improved modes of administering it introduced by Messrs. Clover, Coleman, and Braine, and the ingenious and scientific modes of economizing its

use when this is desirable or necessary (as in public institutions), introduced by the two former gentlemen, are all, however, also so well known to the profession, that your Committee think it unnecessary to do more than allude to them in this Report as doing away with some of the early objections to the use of this agent.

When your Committee issued their preliminary Report their experience rested upon 2,431 cases of the administration of this gas to the human subject. They have now in their possession records of more than 58,000 administrations, and feel that they may speak more authoritatively on the various points therein treated on. This extended experience, however, enables them to add but little to what was then stated respecting its effects on the human subject, beyond the fact that some of the most objectionable therein noticed—especially those of occasional vomiting or a tendency to vomit, conditions of excitability under its influence, hysteria, &c.—seem to have been less manifested of late than they were formerly; which your Committee attribute to two causes, viz., that the agent is now supplied in a state of greater purity than formerly, and that the appliances for its administration are more perfect, thereby preventing the access of atmospheric air with the gas during its exhibition, always a source of inconvenience, if not of failure; and that none of its peculiar effects have ever, to the know-

ledge of your Committee, proved so severe as to require from them the recommendation of any special modes of treatment.

Amongst various other points which your Committee have endeavoured to determine in reference to the action of this gas, not touched upon in their former Report, are the following; viz.:—

1st. How does it destroy life when given in over-doses to the healthy individual?

2nd. How far may it be employed with safety and success in combination with, or as an adjunct to, other anæsthetics?

With reference to the first of these points, it was observed, from a number of experiments performed upon the lower animals—chiefly dogs—that respiration invariably ceased before the action of the heart. An autopsy made after respiration had been suspended half a minute, but before the heart had quite ceased beating, showed the lungs only moderately engorged with blood, and both sides of the heart about equally filled with blood; from which it seems to your Committee it might be inferred that the action of the anæsthetic upon the “nervous centres,” controlling the action of the respiratory organs, is the possible, if not the probable, cause of death. Whilst the heart’s action could still be felt, artificial respiration and electricity applied along the phrenic nerves, were found by your Committee successful as a means of resuscitation; but after cessation of the heart’s

action neither of these modes of treatment had the least effect; nor has any other treatment, so far as your Committee have been able to learn, proved of any avail after the latter occurrence.

With a view to test the second of the above-named points, several experiments were tried with nitrous oxide, chloroform, and air mixed in different proportions. Dogs experimented upon with these mixtures were slower in becoming unconscious to pain than when subjected to nitrous oxide only, owing apparently to the resistance they made to breathing them, but the anæsthesia was more prolonged; still these mixtures seemed open to this objection, viz., that they produced as much struggling and excitement as chloroform often does when given alone. A member of the Committee who inhaled a mixture of this gas and chloroform, in the proportion of 8 per cent. of the latter, to insensibility, suffered all the disagreeable effects of the inhalation of chloroform, and exhibited much excitement. Your Committee cannot therefore recommend the use of these agents *mixed*, for the foregoing reasons, but are of opinion that they may be used with great advantage as auxiliaries or adjuncts to each other under certain circumstances.

That the two agents, nitrous oxide and chloroform, inhaled in succession, are not incompatible, was shown by the following experiment. To a dog of mongrel breed and small size nitrous oxide

was administered until respiration had ceased for several seconds, and the heart's action, though still felt, was becoming feeble. In place of the nitrous oxide, a mixture of air and 10 per cent. of chloroform (which when breathed by a dog causes death, on an average, in fifteen minutes) was then rapidly substituted. The dog recovered its power of respiration, and became partially conscious in about three minutes, but died at the end of twelve minutes.

The value of employing nitrous oxide as an adjunct to chloroform was illustrated in the following case. Two members of the Committee had to perform an operation upon the mouth of a patient whose weak action of heart rendered it essential that he should be placed under the influence of chloroform for the shortest time possible necessary for the operation in question. Under insensibility, produced first by nitrous oxide, a free and deep incision into hyperæmic structures was made, and the patient allowed to recover and wash the mouth until the wound had ceased bleeding, which occupied some time. After this a mixture of chloroform and atmospheric air, in the proportion of rather less than 4 per cent. of the former, was given, and, the wound being free from blood, the remainder of the operation only occupied a short time.

This gas may also be employed with advantage as an auxiliary to ether (undoubtedly a safer

anæsthetic than chloroform) in the following manner. The patient being first rendered insensible by inhaling the gas in the ordinary way, the insensibility may be prolonged by substituting the vapour of ether for it, by means of an apparatus supplied with a "two-wayed" stopcock. This mode of using the gas as an adjunct to ether, besides meeting and doing away with two great objections to the use of the latter with most patients, viz. its smell and pungency, expedites its anæsthetic action. As, however, the disagreeable after-effects of either chloroform or ether may in any case follow their administration after nitrous oxide, it is only in peculiar cases that your Committee would recommend the combined use of these agents.

Your Committee cannot close this Report without recording their opinion of the comparative safety of this anæsthetic as contrasted with any other yet discovered, seeing that out of the 58,000 cases of its administration in this country of which they have records, and the thousands of cases of its known administration both in this and other countries of which no special records have reached them, not a single case of death fairly referable to the action of this gas has occurred; but while they have great pleasure in recording this fact, they feel it to be an imperative duty to repeat here the caution for proper care in its administration, given in their former Report, as

it is clear, from its effects on animals when carried beyond a certain point, that death may be produced by it in the human being, if carelessly or recklessly used, or if used by persons not properly trained to its administration.

Your Committee are well aware that the physiological information contained in this Report may be said to be mainly of a negative character, and that many of the subjects touched upon in it have already been entered into more fully, and made public, by individual members of the profession; but as negative evidence tends largely to clear up doubtful points in science, and as their Report embraces some subjects not treated upon elsewhere, so far as they know, they venture to hope that it will be considered to convey information which will prove both interesting and useful to the profession.

Finally, your Committee beg to return their best thanks to those members of the profession to whom they addressed their circular of inquiry in the spring of the present year, for the kindness and readiness with which they responded to those inquiries, and the pains and trouble they took in furnishing their answers.

(Signed) W. A. HARRISON,

Chairman.

DISCUSSION.

The PRESIDENT said, as at that late hour of the evening it would not, in his opinion, be wise to commence a discussion upon the very interesting and comprehensive Report they had just heard read, he thought he should best carry out their wishes by postponing it until their next Meeting. The remainder of their time that evening they could devote to discussion upon Mr. Gascoigne Palmer's Paper.

Mr. MUMMERY, jun., produced a drawing of the instrument employed by Mr. Hele, termed a nitrous-oxide governor, and alluded to by Mr. Palmer in his Paper.

Mr. CLOVER said the so-called storing-bag described by Mr. Palmer appeared to him to be only a modification of the supplemental bag he had introduced, and he thought the latter arrangement in every way met the requirements pointed out by the writer of the Paper.

Mr. COLEMAN said it appeared to him that there was this difference between the two appliances: that described by Mr. Palmer was, so to speak, the representative of Mr. Clover's or Mr. Cattlin's bags. Where the supply of gas was not near at hand, such an arrangement was very desirable, for the friction of a long tube must greatly impede the free flow of the gas in its progress to the patient. When the above-named bags were used with a good diameter of tube leading to the face-piece, the storing-bag would be useless. Mr. Palmer employed the supplemental bag as well, and for the same purpose as its originator intended.

Mr. HUNT said his experience was somewhat different from that of the writer of the Paper. When he failed to anæsthetize a patient, he commonly removed the weights from his gasometer, and then with the increased pressure any tendency to draw air by the side of the face-piece was overcome.

Mr. DENNANT remarked that he had used the gas from the gasometer many hundreds of times, but he had never found it necessary to remove the weights as stated by the last speaker. In his experience the simple act of inspiration upon the part of the patient was quite sufficient, when the gasometer was not far distant, to furnish the patient with an abundance of gas. He had never had a single case of sickness. He would like to ask Mr. Clover whether, in his opinion, the existence of lividity seen in the patient's face had anything to do with the pressure upon the gas.

Mr. CLOVER thought not. He considered the existence of lividity as an almost necessary consequence of the action of the agent upon the blood, but it differed in amount in different individuals.

Mr. PALMER then replied to the remarks of the various speakers. Summing up, he said his experience had taught him that an over-abundant supply of gas was as detrimental to good results as was too little. He appealed to his recorded cases, with and without the use of the store-bag, as proofs of the value of the latter : they showed that, in its employment, anæsthesia was more rapidly produced, longer kept up, and with less appearance of lividity.

The PRESIDENT then adjourned the Meeting to the 2nd of December, when the discussion upon the final Report of the Committee appointed to investigate the merits of nitrous oxide as an anæsthetic would take place ; according the thanks of the Society to Mr. Palmer for his Paper, and to the various donors named for their contributions to the Library and Museum.

GENERAL MONTHLY MEETING,

Monday, December 2, 1872.

THOMAS UNDERWOOD, ESQ., PRESIDENT, IN THE CHAIR.

THE Minutes of the last Meeting were read and confirmed.

Mr. THOMAS FRANCIS UNDERWOOD, M.R.C.S., 14, Gower Street, was nominated for resident Membership.

Mr. JOHN O'DUFFY, of Dublin,
Mr. WILLIAM EDWARD KEELING, of Devizes, and
Mr. ROFF KING, of Shrewsbury, were nominated for non-resident Membership.

Mr. G. R. KEELING, L.D.S., of Epsom, having signed the obligation book, was admitted a Member of the Society.

The following donations to the Library were announced :—

Transactions of the Medico-Chirurgical Society, from that Society.

ARTHUR on "Prevention and Treatment of Decay of the Teeth," from Dr. BOGUE.

The CURATOR announced the following donations to the Museum, viz. :—

By Mr. WORSLEY, Preston,—Old Bone Pieces.

Mr. H. C. H. LONGHURST, Leicester,—Old Bone Pieces.

Mr. F. PETTY,—A Supernumerary Tooth.

Mr. J. KEENE, Boulogne,—Several malformed Teeth.

Mr. R. ACLAND, Exeter,—A Tooth which had been filed in 1818, and had since remained sound.

Mr. TURNER,—Models, before and after operation, of a case in which great displacement and distortion of the left half of the jaw had been caused by a tumour situated in the zygomatic or pterygoid fossa.

Mr. J. H. REDMAN, Ryde,—Specimen of dilaceration, two-fanged canine, supernumerary from between the first molar and second bicuspid, and a model of excessive erosion of the teeth.

Mr. J. C. Fox exhibited an improved instrument for working to the bite, presented by Messrs. GRAHAM and WOOD (of Stockton-on-Tees); also a case of irregularity in the incisors in the upper jaw of a patient, aged about ten years, where the central incisors were placed in front of the laterals and cuspidati. Also some specimens of a new white plastic filling, introduced by Mr. FLETCHER, of Warrington, respecting which the latter gentleman entertained very sanguine opinions. It was of a density nearly approaching that of the enamel, and appeared to resist the action of strong acids.

The PRESIDENT exhibited a case of treatment of caries by excision which had been done fifty-six years ago; the tooth was removed by Mr. James Parkinson, within the last six months.

Mr. C. S. TOMES related a case where a patient had swallowed a denture, consisting of a gold plate, having three wire clasps, and carrying an incisor tooth. It occurred during sleep, and the patient awoke in imminent danger of suffocation. Before the arrival of a medical man it slipped further into the œsophagus, with abatement of the more urgent symptoms. Upon the arrival of the medical man she was desired to eat some bread, which carried the plate in the act of swallowing into the stomach. She felt no inconvenience from it, notwithstanding the administration of the doubtful expedient of a purgative, until the plate was passed at the expiration of a week. The plate was handed round for inspection.

Mr. O. COLES exhibited an appliance for keeping the lower lip away from the teeth during the operation of scaling ; likewise a new form of mirror, which enabled the operator to obtain a clearer view of teeth situated at the back of the mouth. He also called the attention of the Society to a new agent for destruction of exposed dental pulps, which had in his hands proved very successful. The agent in question was a preparation of pepsine—the *pepsine porci*. Its application was attended with no pain. It might be left in contact with the dental pulp for a week with perfect safety ; but he found, by experience, three days commonly sufficient to effect the object in view. In this respect its application was much safer than that of arsenic.

Mr. HARDING said that he had not found any bad consequences ensue from leaving arsenic in contact with the pulp of a tooth for a week or even more.

The PRESIDENT said he had always entertained a strong objection to the use of arsenious acid unless with great caution. Speaking, he might say, from extensive experience, he had always found it expedient, where great pain had ensued, to remove the application in six hours, but never did he allow it to remain more than twenty-four hours. He thought that great discrimination should be used in the employment of all such potent agents.

Mr. COLES fully agreed with the President, and dissented from Mr. Harding. He had known cases where teeth had become perfectly necrosed under such conditions. One special advantage he claimed for this application ; viz., that it did not destroy the whole pulp, a proceeding to which he was much adverse ; it only destroyed or removed that which was diseased or disorganized : it acted particularly well where the pulp was inflamed or tender.

Mr. SEWELL considered the subject introduced by Mr. Coles as one of great scientific value. The pepsine differed from caustics in being a simple innocuous solvent of animal matter. He believed the agent would come very largely into use.

Mr. CHARTERS WHITE feared that there would be a danger in leaving a quantity of partially disorganized tissue in the cavity of a tooth.

Mr. COLES said as it acted upon the dead portions of the tissue only, that which was left was healthy tissue.

Mr. COLEMAN said he was glad to receive the latter explanation from Mr. Coles. At the outset it was spoken of as an agent for destroying the pulp, and he was surprised to hear that pepsine could so act upon a vitalized tissue. Now a different view of the matter was given, and he could only hope that Mr. Coles's favourable experience might be confirmed by others, for, if so, it would prove an almost invaluable boon to them. He should like to ask Mr. Coles to describe more definitely his mode of applying it.

Mr. COLES said he mixed some of the powdered pepsine into a paste with dilute hydrochloric acid ; *i. e.* with the dilute hydrochloric acid of the pharmacopœia, diluted with one hundred parts of water. This he left in contact with the pulp and covered over with wax, for three days. Upon removing it, he washed out the cavity well with warm water and swabbed it with carbolic acid dissolved in glycerine. He then capped the pulp, filling the cavity temporarily for some months ; after which it was filled permanently.

On a Case of Abscess of the Pulp in a Grampus
(*Orca gladiator*). By CHARLES S. TOMES, M.A.

THE specimens which form the subject of this communication, though not taken from a human being, are nevertheless of no inconsiderable interest, inasmuch as they exemplify a pathological condition which is but seldom met with. A few years ago Dr. Murie* brought before this Society some examples of dental disease taken from the lower animals, which, in at least the case of erosion of the teeth, went far towards settling one of the most disputed points in dental pathology; and just as comparative physiology has thrown much light upon human physiology, so we may fairly expect the study of disease in lower animals to elucidate human pathology. Without further apology for taking up the time of the Society with the consideration of one of the lower animals, I will proceed to the description of the specimens. About a year ago a large grampus, measuring 11 feet 6 inches in girth, and 18 feet in length, apparently in an enfeebled condition, made its way up the river Severn, and was captured at a salmon weir near Oldbury by some fishermen, who killed it with a blow of a crowbar.

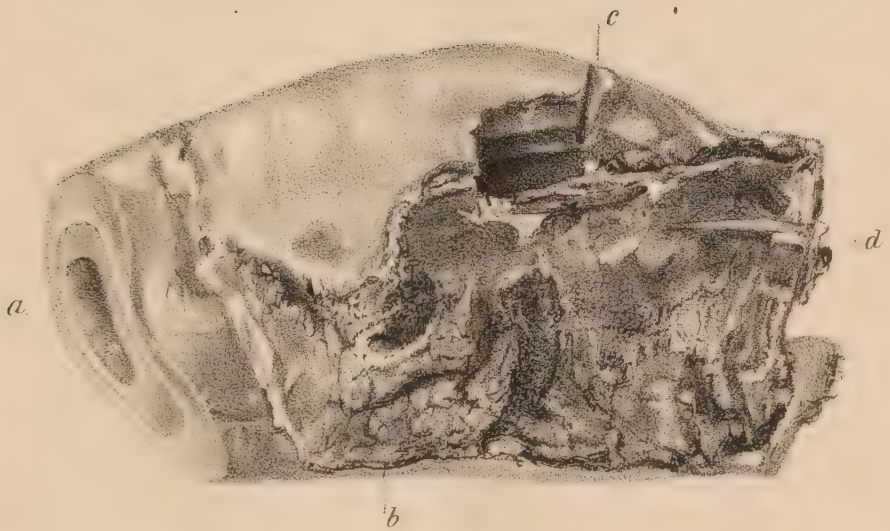
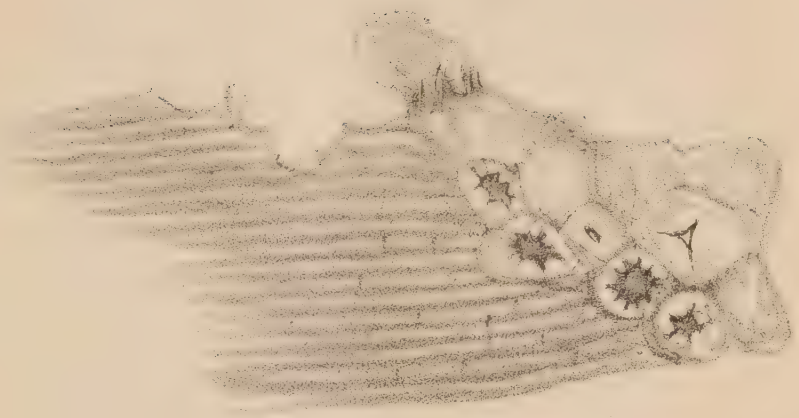
* Transactions of Odontological Society, Old Series, vol. vi. 1867, p. 37; and New Series, vol. ii. 1870, p. 257.

When it had been exhibited for a time, my friends Messrs. Moseley and Ray Lankester, after overcoming no small difficulties in its preparation, placed the skeleton in the Oxford University Museum. Finding that many of the teeth were remarkably diseased, Mr. Moseley placed some of them in my hands for examination, and the following are my notes upon the subject.

Selecting for the purpose of description a tooth which is diseased in an extreme degree, the following points are noticeable. The fang is unduly short; instead of tapering down to a blunt point, as in healthy cetacean teeth, it terminates by a ragged, wide, open extremity (*d*, fig. 2). Below the level of the attachment of the gum, the side of the tooth is rough and black, being in many places coated with rugged incrustations (*b*). These incrustations are not, as might at first sight be supposed, stalactitic growths of cementum, but are made up of very hard, dense tartar, which has been deposited far down within the socket.

In addition to being roughened by depositions of tartar, the surface is irregularly excavated; some of the deepest of these excavations pass through the whole thickness of the dentine (as is the case in that seen at *c*) and open into the pulp-cavity, whilst others are perfectly isolated depressions upon the surface.

Around the open basal end of the fang, and here and there upon its surface, are nodular excrescences



of cementum ; but the cementum is not generally thickened over the whole tooth.

Another striking abnormality is, that the pulpcavity in the crown is widely opened by the wearing down of the apex of the tooth,—a fact which is, as will presently be seen, the source of all the mischief.

In submitting sections of the tooth to microscopic examination, appearances similar to that represented in fig. 1 were met with ; the dentinal tubes were found to be abruptly interrupted in their course, and the margin of the fragments to be irregularly festooned by absorption, presenting the contours known as the “lacunæ of Howship.”

The section represented in fig. 1 was taken from one of the irregular excavations before alluded to, and corresponds to the point marked *c* in fig. 2 ; on its upper edge is a border irregularly notched by absorption, whilst on the right-hand edge the depressions are occupied by calcified osteoblasts (encapsuled lacunæ). Wherever sections of the roughened surfaces of the tooth were made, these same characters were met with ; namely, festooned outlines left after absorption of the dentine, in some places filled up by calcified osteoblasts, in others empty.

Sections taken from the interior of the pulpcavity present a similar appearance, the same processes of absorption and subsequent deposition of new osseous tissue having taken place largely,

though, as the absorption has taken place to a far greater extent than the subsequent calcification of osteoblastic tissue, there is everywhere great loss of substance.

In general character these sections correspond very closely with the appearances observed where alternations of absorption and deposition have taken place upon the fangs of teeth: an excellent example of this condition is given by Professors Heider and Wedl, in their "Atlas zur Pathologie der Zähne," Taf. xii., fig. 110, and as a woodcut of this figure already is in the possession of the Society, it having been copied for Mr. Henry's



Dentine encroached upon by imperfect osseous tissue, from the fang of a temporary molar. After Heider & Wedl.

paper upon Inostosis, I have reproduced it here for the purpose of comparison.

It not uncommonly happens that bullets aimed at an elephant's head effect an entrance into the growing pulps of the tusks : imbedded there they cause inflammation and perhaps suppuration of the pulp, as a result of which the adjacent dentine becomes excavated by absorption. These so-called "abscess cavities" are not very rare, and of them Prof. Wedl ("Pathologie der Zähne," pp. 145 and 243) says that "the dentine has been encroached upon by multi-radiated bone-corpuscles."

On the walls of the pulp-cavity, where the osseous material deposited is in most places very thin, the brown colour of the "encapsuled lacunæ" strongly recalls the appearances characteristic of Nasmyth's membrane, and of tissue elsewhere found on the borders of calcification.*

And it is noteworthy that a precisely similar action has gone on inside the pulp-cavity and on the exterior of the root,—in other words, that two structures so dissimilar as a tooth-pulp and the periosteum of the socket are alike able to effect absorption and a subsequent deposition of osseous material on the eroded surface.

* Cf. a Paper by the author, "On the Nature of Nasmyth's Membrane," in the *Quarterly Journal of Microscopical Science*, October, 1872.

The regularity everywhere observed in the direction of the dentinal tubes, no matter how uneven the external surface may be, and their abrupt interruption by the "lacunæ of Howship," or by calcified osteoblasts, very distinctly prove that the malformation did not exist at the time of the first formation of the dentine; in other words, that the dentine forming the outside of the tooth was at first perfectly smooth and normal, and that its present rugged appearance is wholly due to a subsequent sculpturing of the surface by the process of absorption.

And there can be no doubt that the whole morbid action was set up by the exposure of the pulp and its consequences, in the form of inflammation and suppuration; the question remaining for solution being, how it came about that the pulp-cavity was not obliterated by progressive calcification before it was reached by the wearing-down of the crown; since amongst cetaceans it is almost obliterated through the whole length of the tooth in the normal condition.

If the jaws of grampuses or other allied cetacean forms be examined, it will be found that the teeth in the upper and lower jaws alternate, so that when the jaws are closed they interdigitate. Hence the wearing-down of the teeth by use takes place not upon their ends, but upon their sides, so that the tips of the teeth remain sharply pointed even in an aged animal.

In the Oxford specimen, however, this regular antagonism, or rather interdigitation, of the upper and lower teeth has been by some cause disturbed, so that all the teeth on the right side of the mouth met point to point. As a result of this, the wear upon their apices was greatly increased ; so greatly, that the wearing-down of the crown has exposed the pulp-cavity before it could become obliterated by progressive calcification. The exposure of the pulps has had much the same effect upon them as the entrance of a bullet has been seen to have upon that of an elephant's tusk, and has led to the extensive removal of dentine which had already been formed, as well as to the arrest of the further growth of the teeth.

From an examination of the skeleton I was quite unable to discover the cause of this disturbance in the antagonism of the teeth ; but it may be remarked that an absence of exact bilateral symmetry is far from unusual in the skeletons of cetacea, the jaws in particular being sometimes strangely twisted.

In this instance the displacement was so slight that its cause could not be distinctly made out after the skeleton had been cleaned ; yet it was sufficient to alter the antagonism of all the teeth on the right side of the mouth, and lead to the exposure and destruction of their pulps by placing them directly opposite to one another. And it seems far from improbable that, as is suggested by my friend

Mr. Moseley, this disordered condition of the mouth may have had much to do with the capture of the animal, which would hardly have been effected had it not been in an enfeebled condition.

I am not aware that any instance of a precisely similar state of things has been recorded as occurring in human teeth,* although an approach to this condition is exceedingly common where long-standing irritation has existed in the membrane of the socket. And Mr. Bell ("Anat., Physiol., and Diseases of the Teeth," p. 173) has recorded a case of a closed cavity in the coronal dentine of a human molar, the parietes of which would, doubtless, had they been submitted to microscopic examination, have presented microscopic characters similar to those met with in the teeth of the grampus. And, indeed, this condition finds a tolerably close parallel in those cases in which, after prolonged irritation in the socket, the apical foramen of the fang is found to be enlarged, and the surface irregularly wasted.

* Since the foregoing statement has been in print, I have had the good fortune to meet with a human canine tooth, the fang of which is in a condition most closely resembling that of the grampus's teeth, save only that the cause of the disease is more obscure, as the crown of the tooth is perfectly sound. Nothing is known of the history of the case, the tooth having lain unnoticed amongst many others; and I little thought, when penning the opening sentences of this Paper, that their truth would so speedily be put to the proof.

DISCUSSION.

The PRESIDENT then informed the meeting that the time had arrived for the discussion upon the second and final report of the Committee appointed by the Executive of the Dental Hospital and the Council of the Odontological Society, to investigate the merits of nitrous oxide as an anæsthetic, read at their last meeting, and which they had not time upon that occasion to discuss. He had the pleasure of seeing many visitors present, and as most of them were gentlemen well conversant with the subject under consideration, he trusted they might have the benefit of their experience, and that they would consider themselves members for the occasion.

Mr. NORTON said he was present at the meeting when the first report of the Committee was discussed. He then expressed his opinion, founded upon experiment on rabbits, that the effects of the gas were not due to asphyxia. He believed there was an anæsthetic power in the agent, yet it was not clear to him how it could develop its effects in so short a time as sixty seconds. Again, in other cases, without apparent cause, it took much longer. In one recently the patient was three minutes and a half respiring the gas before losing consciousness; the respirations were apparently normal, the pulse remaining at about seventy. After becoming unconscious, the patient remained so for quite seventy-five seconds; in such a case it seemed impossible that this condition could be due solely to asphyxia, but must be set down to a special action of the gas. With regard to the experiments of the Committee, there was no evidence one way or another upon this point: they only went to show that it was not decomposed in the blood, which, if anything, favoured the view that it was not an anæsthetic. If such should prove the case, it would be a matter of deep regret to both dentists and surgeons. He should like to know if any experiments had been tried with mixtures of nitrous oxide and oxygen—say in the proportions

in which oxygen existed in atmospheric air. If by this means anæsthesia could be kept up for at least three minutes and a half, it might be employed for many operations in surgery ; but at present, from its transient effects, it could not be so used.

Mr. COLEMAN apprehended Mr. Norton had failed to remember the tenour of his remarks at the meeting to which he had alluded. According to his (Mr. Coleman's) recollection, Mr. Norton had then expressed an opinion favourable to the view that the protoxide of nitrogen acted in no other way than by cheating the lungs of a supply of oxygen, thereby bringing about a condition of asphyxia, a term which Dr. Burdon Sanderson suggested would be more appropriately replaced under such conditions by that of *apnoea*. Mr. Norton had expressed the opinion that it would be a matter of deep regret if the agent should turn out to be no anæsthetic. Mr. Coleman did not understand Mr. Norton's reasoning ; he would regard any agent which for a time deprived the individual of the power of appreciating sensations as an anæsthetic—he took the simple derivation of the word. In treating upon the physiological action of the gas, the Committee had been very guarded in the wording of their report, but he might thus far express his opinion, viz. that nitrous oxide acted in a markedly different manner from those gases which might be respired, such as nitrogen and hydrogen, but which yielded nothing to the blood ; they simply withdrew the oxygen the lungs and the blood contained. In the case of nitrous oxide, a gas largely soluble in the blood, was presented to it, and although their experiments showed it not to be decomposed in that fluid, yet its presence in it no doubt produced important effects—they might be dynamical. Anæsthesia produced by the former was much more slowly brought about and less perfectly established than by the latter.

Mr. NORTON, in reply, said his remarks at the meeting referred to had been incorrectly reported ; what he did state was that a deception was practised upon the lungs, which permitted their power of movement, but prevented the processes of respiration from being carried on. He did not deny an

anæsthetic power to the gas, but that, from the rapidity of the process, it had hardly time to manifest an anæsthetic action. Mr. Coleman had said that nitrous oxide produced anæsthesia more readily and perfectly than other named gases. If so, it was an anæsthetic, but the Committee had decided that it possessed no anæsthetic power, but that the whole process was one of asphyxia.

Dr. KIDD said that the effects laughing-gas produced were proof that it really was an anæsthetic, and he considered it a very valuable one, too. He thought it was a pity to split hairs upon the matter. He had heard the agent abused in a very violent manner ; it had been described as no anæsthetic, but, on the contrary, a most dangerous and fatal asphyxiating compound, against which remarks he had at the time entered his protest. The original idea entertained respecting it in America was that it was a stimulant and excitant, and under which conditions a patient might be cheated of his tooth, and that it was really more of a narcotic than an anæsthetic. If it were no anæsthetic, then the sooner they got rid of it the better. It was not, however, perfectly safe ; deaths had occurred from it. One was recently reported.

The PRESIDENT : May I ask where ?

Dr. KIDD : In the American journals of the present month. The patient was a man of sixty years of age ; it was taken for the removal of a tooth, and he never recovered from it. The post-mortem appearances were precisely those seen after death from anæsthetics.

Mr. COLEMAN remarked that he fully agreed with Dr. Kidd that it was splitting hairs in arguing whether nitrous oxide were or were not an anæsthetic, he would however like to remark upon what had fallen from Mr. Norton, that he did not consider it essential for an agent to be called an anæsthetic that it must of necessity be decomposed in the blood. There was reason to believe that all the anæsthetics used, including also such drugs as morphia, owed their effects to preventing or retarding the union of oxygen with the tissues composing the nervous centres. In reply to a question put by Mr. Norton,

he could inform him that mixtures of nitrous oxide and oxygen in various proportions had been employed, but that they had not been attended with success ; they produced much struggling and excitement, with but imperfect anæsthesia.

Mr. C. S. TOMES said, whether there were any direct anæsthetic power in nitrous oxide, further evidence was necessary to decide. When this agent was first introduced into this country, it was his pleasure to assist Dr. Burdon Sanderson in some of his experiments with it upon the lower animals, as also with nitrogen. He had also witnessed the administration of nitrogen, by Dr. John Murray, to dental patients at the Middlesex Hospital. In the latter cases the patients became semi-unconscious, but did not remember generally the operation of removal of their teeth : they became livid, and exhibited other symptoms of asphyxia. He did not recollect the ordinary time it took to produce unconsciousness, but it was certainly much longer than in the case of nitrous oxide. His opinion was that there was a marked difference in the action of the two gases. Experiments made upon the lower animals were never very conclusive ones, but they gave evidence that asphyxia was more readily recovered from than was the unconsciousness brought about by a poisonous drug.

Mr. NORTON said the anæsthesia produced by nitrous oxide would not last long enough to allow of the amputation of a thigh without the patient feeling pain, in which case the gas must fall to the ground as far as general surgery was concerned.

Mr. COLEMAN said he must again differ entirely with the assertions Mr. Norton thought fit to make. He had given the gas for operations, lasting quite as long as that usually employed in the amputation of a thigh ; he had administered it for operations performed by Sir James Paget, occupying from six to eight minutes, one was an amputation—a small member, he would admit, but in each case he could have kept up the anæsthetic effect for a much longer time ; others had kept it up for much longer periods. Dr. Marion Sims, for instance, had performed operations under its influence, occupying over half

an hour ; so had several in this country. He would admit that it was not so suitable for long operations as other anæsthetics, it required more skill on the part of the administrator. In many operations it was no small advantage to have an agent so readily recoverable from, or so free from the tendency to cause vomiting as nitrous oxide. For small short operations he thought the nitrous oxide ought to be more generally employed than it was. Since its introduction he had seen at least six cases of death recorded either from chloroform or bi-chloride of mytheline, where nitrous oxide might have been well employed, in all probability with a saving of life in each case.

Mr. CUMBERBATCH stated that he had employed the nitrous oxide very largely at St. Bartholomew's Hospital. He had used it chiefly for minor operations, but had employed it for some occupying several minutes. In a case of fistula in ano, he kept up anæsthesia perfectly for ten minutes.

Mr. BAILY said that he had at the Cancer Hospital kept up anæsthesia with nitrous oxide for an operation occupying thirty-five minutes. When the operation was commenced there was no idea that it would occupy nearly so long a time, so it was undertaken with nitrous oxide, which was continued to the end. A marked advantage procured by this agent over chloroform or ether for certain operations, was the small chance of vomiting ensuing ; it was upon this ground that Mr. Critchet and some other Oculists preferred it for certain operations upon the eye. He always kept a supply of the gas at the Cancer Hospital for short operations, occupying from one to five minutes, and for these he preferred it to chloroform or ether. The great objection to its use at Hospitals was, he considered, the expense.

Mr. TURNER thought they ought to be very cautious in pressing the adoption of the agent too forcibly upon others. There was, to his mind, an element of uncertainty respecting its action : the report of the Committee fully showed this. They could not therefore be surprised that Surgeons had not so generally adopted it. Even in Mr. Baily's case, that

gentleman would most probably have employed chloroform had he known the operation he mentioned would have taken so long a time as thirty-five minutes.

Mr. NORTON remarked that those who had employed the gas, during operations occupying so long a time as thirty-five minutes, must have frequently allowed the patient to recover consciousness. Now this, in many operations, would permit an amount of hæmorrhage that might prove very serious.

Dr. KIDD said, notwithstanding all he had heard to the contrary, he could only consider the gas, for certain operations, a grand thing as regarded its safety: a beautiful thing, as regarded the fulfilment of the object in view. The absence of vomiting, and the readiness of recovery, were for many cases all-important. He could only express the opinion that the Dentists deserved the greatest credit for the zeal with which they had taken it up. He would suggest whether it would not be desirable to try the effect of a dose of chloral hydrate previous to the administration of nitrous oxide, with the view to prolonging its effects.

Mr. SEWELL said there had been no mention made in the report of apparatus the most suitable for administering the gas. He had always employed a very simple invention of Mr. Norton's. It was much in the form of a speaking-trumpet, and fitted closely over the mouth, with the aid of an india-rubber flange, the nose being closed by the fingers or a clip. It had two valves—an inspiratory and an expiratory valve. He had used it many hundreds of times, and preferred it to any instrument he had seen. The more he saw of nitrous oxide the more he disliked it. The condition of asphyxia was very dreadful to behold, and there were many other unpleasant things about it he did not like. They all knew that asphyxia produced anæsthesia, and they wanted an anæsthetic capable of being used without the extreme asphyxiating effect ensuing. Dr. Richardson had stated that in some Institutions chloroform had been administered many thousands of times without a death, and Dr. Simpson, who introduced chloroform, never had a fatal case. If, on the

other hand, nitrous oxide were given for one minute after anæsthesia was produced, the action of the heart would be stopped, as well as that of the lungs, and death would be instantaneous.

Mr. COLEMAN said Mr. Sewell had been most unfortunate in the authorities he had named. Dr. Richardson had placed the fatality from chloroform higher than any other authority upon the subject; viz., one in two thousand five hundred, and, in the case of the late Professor Simpson, that gentleman had recorded one death at least from chloroform occurring under his own hands.

The PRESIDENT said he offered the thanks of the Society to all the gentlemen who had joined in the discussion that evening. To those gentlemen, especially Mr. Norton and Mr. Sewell, who had taken a somewhat different view from that entertained by the Committee, who had drawn up the report, he could only say that they were particularly obliged to them for pointing out that which, in their opinion, was wanting in the agent under review. The Society desired to hear both sides of the question, and to see it openly and fairly discussed. In expressing his own opinion of the subject, he would do little more than fall back upon the 58,000 administrations recorded to the Committee without a fatal case. In the vast majority of these cases, the patients had been saved severe pain without certainly any serious results; otherwise they must have come to their knowledge. This said much in favour of nitrous oxide. He would not enter into the question as to whether it anæsthetised or asphyxiated; if the latter, it was not objected to, as seen by the general desire of those who had once taken it to take it a second time, and the process, whichever it might be termed, certainly contained but a very small element of danger. As a member of the Committee, whose report they had discussed that evening, he could do no more than say that their thanks were especially due to its Chairman, Mr. Harrison, upon whom the chief labour of drawing up the report had fallen; to Professor Frankland for his most valuable scientific contributions; and to Messrs. Clover and Coleman, who had also with others

laboured hard in the work.—At that meeting it was his duty to name two auditors to inspect the accounts of the Society, and he would ask Mr. Ibbetson and Mr. Holborow King to undertake that duty. He then adjourned the meeting to the second Monday in January in the ensuing year.

ANNUAL GENERAL MEETING,

Monday, January 13, 1873.

THOMAS UNDERWOOD, Esq., PRESIDENT, IN THE CHAIR.

THE Minutes of the last Meeting were read and confirmed.

The following gentlemen were proposed for non-resident Membership :—

MR. MORDAUNT STEVENS, M.R.C.S., L.D.S., 42, Rue
Luxembourg, Paris.

MR. DAVID WATSON, Torquay.

MR. RICHARD BLAIR, Manchester.

MR. WARWICK HELE, L.D.S., Carlisle.

The following gentlemen were elected Honorary Members :—

MR. J. T. CLOVER, F.R.C.S., 3, Cavendish Place,
London.

MR. F. WOODHOUSE BRAINE, F.R.C.S., 56, Maddox
Street, London.

MR. G. H. BAILY, M.R.C.S., Charles Street, London.

The following gentleman was elected a resident Member :—

MR. TOLLEMACHE BULL, 60, Welbeck Street, London.

The following gentleman was elected a non-resident Member :—

MR. WILLIAM BEADELL BACON, Tunbridge Wells.

The following donations to the Library were announced :—

“The Teeth : Notes on their Pathology,” by Mr. OAKLEY
COLES. Presented by the Author.

"The Monthly Review of Dental Surgery," for the past year. Presented by the Editor.

Mr. OAKLEY COLES said he had been requested by Dr. William Süersen, of Berlin, to bring before the notice of the Society an instrument devised by that gentleman, and constructed of hard-rubber for closing apertures in the palate, and for which invention he had received the gold medal of the Society of German Dentists. Dr. Süersen's Essay had been published in this country, but up to the present time his plan had been but little adopted in England. Mr. Coles had tried it, and could speak very favourably of its employment, especially in Hospital cases, where a durable and unalterable material was most desirable. Those portions of it which came into contact with the soft and delicate structures about the pharynx were made smooth and highly polished, so as to prevent any injury arising from friction. Dr. Süersen had treated no less than 155 cases upon this plan, the results of which were highly satisfactory.

Mr. C. J. Fox, in reference to this question, related a case in which, having supplied a patient with an obturator, having the velum constructed of soft rubber, upon its becoming worn out the patient asked if he could not have it of hard material, like the rest of the instrument. Remembering Dr. Süersen's plan he did so, and the patient had since worn it with great comfort.

Mr. COLEMAN, in directing attention to a communication brought before them at the last meeting by Mr. Fox, in reference to a new white filling introduced by Mr. Fletcher, of Warrington, said that the material offered to their notice by the latter gentleman, who was a practical chemist, was brought before the Profession with such pretensions as, in his opinion, to demand upon their part at once the formation of a Committee to investigate the matter. They would remember that the Society pursued a similar course when the oxychlorides of zinc were first introduced. Those compounds were (not by experienced chemists, it was true) confidently recommended as perfectly durable. The conclusions the Committee soon arrived

at were those experience had amply verified; namely, that whilst they might prove very valuable as temporary fillings, they could only be employed as permanent ones in very exceptional cases. If it were as good a material as was asserted, it was very desirable that they should have, as soon as possible, an authoritative declaration of the fact; but if it were not, it was still more desirable that a formal notification of the same should be given. To his mind, this could be better done by a Committee appointed by the Society than in any other way.

Mr. THOMAS ROGERS said he had been on the point of making the very same suggestion, but had been anticipated by Mr. Coleman, whose proposal he would gladly second. He should feel very pleased if such Committee could endorse the assertions of the inventor; viz., that it would be found equally durable to gold, for it would soon be impossible to go on filling large cavities in teeth with that metal at the present fees.

Mr. COLEMAN would also add, "and with the present state of teeth."

Mr. SERCOMBE thought the suggestion a very valuable one. He had on a previous occasion advocated the same course in regard to an invention brought before them, and had at the time pointed out the greater value of testimony obtained in a collective rather than in an individual capacity. The success of such a material as that introduced by Mr. Fletcher might largely depend upon the method of its manipulation and application, points which a Committee could no doubt satisfactorily arrive at. He had already received communications from friends in America respecting it, and had forwarded to them some specimens. He had tried it himself, and from the short experience he had had of it was favourably impressed; but whether it would supersede gold was a very different question. It was certainly harder than the oxychlorides of zinc he had seen.

The PRESIDENT said quite enough had fallen from the two last speakers to show that Mr. Coleman's proposition was one

the Society ought to adopt. The Society, he was sure, held that position in the estimation of the Profession, that they would regard with confidence the dictum of a Committee appointed by it for the investigation of such a subject. Before putting the proposition he would call upon Mr. Coleman to name a Committee.

Mr. COLEMAN would propose their President, Mr. Sercombe, and Mr. C. S. Tomes. In the two former they would have the advantage of really practical men, and in the latter also of a very good Chemist.

Mr. Coleman's name having been also suggested, the PRESIDENT put the resolution that the four mentioned gentlemen should form a Committee for the purpose stated, and report the results of their conclusions, at their earliest possible convenience, to the Society.

Six Scrutineers were then nominated by the Members, at the request of the PRESIDENT, the two balloted being Mr. Petty and Mr. Edgelow, after which the ballot for the election of Office Bearers and Councillors was opened.

The following financial statement for the past year (appended to this report) was then read.

The PRESIDENT said that, owing to the absence of their Curator on a visit to America, the reading of his Report must be deferred until the next meeting. He could not, however, forbear to remark that their Museum had never presented a more satisfactory condition than at the present time. The greatest pains had been taken on the part of their Curator, both as to the arrangement of the specimens and as to their augmentation.

During the period necessary for the ballot, the following subjects were discussed:—

Mr. T. ROGERS called the attention of the members to cases where the enamel had been worn off by friction, and the exposed dentine was extremely sensitive. He had tried

various plans of treatment, but the only one successful under his hands had been that of making a cavity and filling with gold.

Mr. HARDING had found good results from the frequent application of spirits of wine.

• Mr. T. ROGERS had not tried the frequent application of spirits of wine, but chloride of zinc, antimony, and several other agents had failed in his hands.

The PRESIDENT had always used the remedy spoken of by Mr. Harding; viz., spirits of wine. He had found it very successful in cases where caries had been treated by excision. It gave the exposed dentine, after a time, a hard and polished appearance.

Mr. COLEMAN had had a case of the kind mentioned by Mr. Rogers that very afternoon, occurring in an upper incisor, and caused by an edge-to-edge bite. The dentine was intensely sensitive, and mischief at the root of the tooth had been set up. He filed away the antagonist tooth, and then directed the patient to apply sal-volatile,—a remedy first pointed out to him by Mr. Cartwright, and employed successfully in the cases named by the President. He often employed it mixed with spirits of wine.

The PRESIDENT said the late Mr. George employed a mixture of equal parts of sal-volatile and eau-de-cologne.

Mr. HARDING, reverting to some observations he had made at the last meeting of the Society respecting the small amount of harm likely to ensue from leaving arsenious acid in the cavity of a carious tooth for a period of three weeks, said that it was during the past year he had so acted, after reading a paper in the "Dental Cosmos" on the subject. When dental pulps were so subjected to the action of this agent, they could be removed without pain to the patient; whereas, if the removal were attempted after the arsenic had been in contact with the pulp for a few hours only, a considerable amount of pain was often experienced, rendering the removal of the

whole pulp by no means easy. Since the last meeting he had consulted his case-book, and the results of the treatment he had described had been highly satisfactory. Several gentlemen, including the President, had spoken of the injurious consequences likely to ensue from absorption of the drug into the system, but provided due care was taken to prevent the escape of the acid into the mouth, he (Mr. Harding) did not believe it could be absorbed into the system.

The PRESIDENT said, as Mr. Harding had alluded to his having differed from him at the last Meeting, he would only remark that his practice was founded upon the results of long experience, not only of his own but of others. Mr. Harding's view of the matter might prove the correct one, and there might be no great danger in leaving arsenious acid in the cavity of a tooth for so long a time as three weeks. It was a remedy he had always employed with the greatest caution, and when consulted by students or junior members of the profession regarding its use, he had always counselled them not to employ it if they could do without it; but if they were compelled to use it, to instruct their patients to remove the dressing themselves in six hours, should they experience much pain, but if that did not ensue, to have it removed by the practitioner within twenty-four hours. He was glad Mr. Harding had brought forward the subject, as the experience of numbers upon such a point must be valuable.

Mr. T. A. ROGERS had on one occasion accidentally left arsenious acid in contact with a pulp for more than a fortnight, and no ill effects had accrued. He thought the different amounts of pain in different cases were due to pressure or otherwise upon the inflamed dental pulp. In cases where he had employed a gold cap over the pulp, so as to permit it to swell without incurring pressure, little or no pain had resulted. As to the time the agent might, without injurious consequences, be left in contact with the vascular portions of the tooth, much would depend upon the character of the tooth itself. If it were of pearly appearance, and consisting of an abnormal proportion of animal constituents, he would adopt

the plan of early removal of the agent, and also the pulp, which he contended should be done thoroughly, and not partially.

Mr. SEWELL said an important point to settle was the quantity of arsenic which would accomplish the desired object without giving rise to bad effects. One-thirtieth of a grain, it had been stated, was enough to devitalize the pulp of a large tooth. Many practitioners used larger doses than that, which would account for the various results they recorded. Besides its escharotic action, arsenious acid was capable of absorption, and it was this property, perhaps, which gave rise to alveoloperiostitis. When morphia was used in combination with arsenic, it was very rare for acute pain to supervene.

Mr. EDWIN LANE said he had generally employed tannin in combination with arsenic, the result of which was a hardening of the destroyed pulp, which permitted it to be removed with much greater facility.

Mr. CHARTERS WHITE said he was very glad that the subject of the destruction of the pulp had been broached, as it was one of great importance, for it seldom happened that a patient consulted a Dentist till pain warned him that something was wrong, and that pain meant generally an exposed pulp. He would like to see the subject worked out microscopically, as from his observations of the action of acids on the ultimate fibrillæ of the nerves of the dental pulp, he had come to the conclusion that, while the connective tissue was destroyed, the nerve-fibres were the last to be acted on; even in ordinary suppuration of the "nerve," the nerve-fibres were not so far destroyed as the areolar tissue of the pulp. He had not had the opportunity of examining under the microscope a pulp to which arsenious acid had been applied, but doubtless in a Society so numerous as the Odontological, cases would occur where arsenic might be applied one day, and the tooth be extracted the next; and in such cases he should feel much indebted to any gentleman who would send such specimens to him for microscopical investigation, and he would at some future time state the results of his examination.

Mr. COLEMAN said, as some of the Members who had spoken upon the subject under consideration had regarded arsenic as purely escharotic in its action, he would remind the Meeting that that agent had not generally been so classified. The strong acids and chloride of zinc devitalized animal tissues by their great affinity for water, abstracting so much from them that vitality could not be maintained. Nitrate of silver acted so likewise, in consequence of its nitric acid being set free when brought into contact with organic structures. Arsenious acid, on the contrary, was presumed to owe its destructive agency to the intense amount of inflammation it set up in a part; so intense as to cause gangrene. This could hardly be a correct statement in reference to the dental pulp, for, as most must have observed, a pulp to which it had been applied usually bled freely upon attempting to remove it after some eight or ten hours' application, whilst little,—often no pain—could be felt: it seemed to destroy the sensitiveness of the nerve fibrils, but hardly to attack the blood-vessels, at least within the period he had mentioned.

The discussion having terminated, Mr. COLEMAN rose and said: Mr. President and Gentlemen,—This being the fittest occasion for calling attention to any matters connected with the principles or practices of the Society, I avail myself of it in order to bring before the members a question of, to my mind, very considerable importance. To those, Sir, who, like yourself, were members of the Council during the years I had the honour of being one of its number, the subject will not be new, for I think I must have pressed it upon its attention *usque ad nauseam*. The question to which I wish to call attention is the desirability of re-electing some of our former Presidents to again rule over us. When I look over the list of names of gentlemen who have occupied the Presidential chair, I cannot but entertain a fear that, if we continue the practice of annually electing a new President, the time may not be far distant when we may fail to find a worthy successor to the illustrious names which have gone before. I know the opinion is entertained by many of my friends in the Society that the exalted post of President is one which each in turn may hope

to aspire to, provided he has taken a goodly share in the work of the Society. From this opinion I entirely dissent, for I believe, were such principle admitted a great incentive to original investigation would be done away with. The President of a learned Society like ours should, I conceive, be one who has been largely instrumental in extending the bounds of the science the Society he presides over was founded to develop; his name should be known beyond the narrow circle of his own profession. Mere interest in the Society with success even in practice should, to my mind, be alone no passport to that seat of honour. The true success of a Society such as ours is evinced more by the status of its Executive, and especially of that of him who presides over it, rather than by the number of its members. A really influential and highly honoured President will undoubtedly draw goodly gatherings of the members he presides over, and, as our meetings do from want of novelty or other causes begin to show some little evidence of languor, the question I raise is one we may very seasonably discuss. Far be it from me to even hint that any who have already occupied the chair our present President so ably fills have not been worthy of the honour, but if I am candid I must state my opinion that some at least whom to-night you will probably elect as Vice-Presidents, and who may in two or three years be nominated to the office of President, would, to my mind, occupy that position with more comfort to themselves and more honour to the Society some ten or twelve years hence. I entreat you to give this subject your most earnest consideration; it has had mine for at least seven or eight years, and the opinions I hold respecting it grow stronger year by year. The junior Vice-President on the house-list of to-night so strongly entertains the opinions I have uttered, that should he be invited in due course to occupy the Presidential chair he will not be able to do so, but will retire in the hope you may endorse his views by electing in his stead one of the former Presidents of the Society.

Mr. THOMAS A. ROGERS, as one of their former Presidents, could not but feel flattered by the remarks Mr. Coleman had

made in reference to those who had been honoured with the post he had filled, still he could not agree with that gentleman. When he looked over the list of members of their Society, he saw the names of many who would worthily fill that post, and not least, certainly that of Mr. Coleman himself. He considered the Society profited by the new blood introduced year by year into the Council and each other office.

The PRESIDENT said the question raised by Mr. Coleman was too large a one to go more fully into upon that occasion. He was sure it would receive the due attention both of the Council as well as of the members at large. He would read to them the results of the ballot.

President.—Isaac Sheffield, Esq.

Vice-Presidents.—Resident : Edwin Sercombe, Esq. ; Charles Vasey, Esq. ; Alfred Coleman, Esq. Non-resident : John A. Baker, Esq. (Dublin) ; Peter Orphoot, Esq. (Edinburgh) ; S. Clifford Gibbons, Esq. (Brighton).

Treasurer.—James Parkinson, Esq.

Librarian.—Thomas A. Rogers, Esq.

Honorary Secretaries.—T. Henry G. Harding, Esq. (Council) ; Edwin F. Lane, Esq. (Society). For Foreign Correspondence : George Gregson, Esq.

Councillors.—Resident : W. F. Forsyth, Esq. ; E. H. King, Esq. ; Joseph Rogers, Esq. ; E. J. Winterbottom, Esq. ; W. A. Harrison, Esq. ; John B. Fletcher, Esq. ; S. J. A. Salter, Esq., F. R. S. ; James S. Turner, Esq. ; Aaron G. Medwin, Esq. Non-resident : G. S. Williams, Esq. (Clifton) ; J. H. Martin, Esq. (Portsmouth) ; J. K. Chisholm, Esq. (Edinburgh) ; Daniel Corbett, Esq. (Dublin) ; F. J. Clouston Scott, Esq. (Swansea) ; George Henry, Esq. (Hastings).

The PRESIDENT, having requested the visitors present to retire for a short time, read the proposed alteration in the bye-

laws, viz., that in Bye-law XVIII., line 5, after the word Members, "and the Curator of the Museum, *ex-officio*," be inserted, which was unanimously adopted by the members.

The PRESIDENT then read his farewell address.

GENTLEMEN.—The election of Office Bearers for the ensuing year having now taken place, I wish to say a few words on the present state of the Society, and on the events which have occurred during my year of office.

Presidential valedictory addresses are apt to appear to outsiders stereotyped affairs, and it is only when we are actually called to the task that we find how much there is of real living—ay, even of painful interest, in making a farewell address to those who, having paid you the highest compliment in their power, the electing you for a time to be their representative, are assembled to hear your account of your stewardship. I address you with an earnest hope that my efforts for the good of the Society may have been realized, and that the expectations you formed of me may not have been disappointed. I have endeavoured to provide for you papers of interest on matters specially connected with our branch of practice. Some of these have shown great originality and research : others, of a more practical character, have elicited much valuable discussion, which cannot have failed but to be of great benefit to those who listened to it. I had hoped to obtain a paper from Professor Huxley, but on his return to England in April last I received from him a note, saying that he very much regretted he was unable to comply with my request, as, though his health was much improved, he must for some time to come abstain from all but necessary work. I trust the Society may at some future date obtain a paper from this distinguished physiologist.

I beg to tender to the authors of the several papers my warmest thanks for their ready and kind acquiescence to my requests, and for their zealous labours in behalf of our common interests ; and, at the same time, to congratulate the members on what I trust they will consider an instructive year.

The second and final report of the Joint Committee ap-

pointed by the Society and the Dental Hospital to inquire into "The Value and Advantages of the Nitrous Oxide Gas as an Anæsthetic in Surgical Operations," was presented and read to you at our November meeting. All of you being in possession of this report, I will do no more on this occasion than express how deeply the Committee were indebted to Dr. Frankland for his most valuable contribution to it.

Before referring to the financial condition of the Society, I gladly seize this opportunity of acknowledging the debt of gratitude we owe to our late Treasurer.

Mr. Harrison decided to relinquish his position as Treasurer at the end of our last year, namely, in October ; and it having been my good fortune to know Mr. Harrison publicly and privately for some years, it is with no ordinary pleasure that I, as your President, beg to convey to him the earnest and heartfelt thanks of the Society for the zealous and business-like manner in which he has discharged the duties of a post involving much sacrifice of time, much trouble, and requiring great tact. I happen to know how often, in his kind desire to spare the feelings of others, he has imposed on himself much personal inconvenience. Mr. Harrison has ever proved himself a warm and earnest friend to the Society, ever ready to give up time which he could ill spare to advance its interests ; and I can assure him that, in his retirement from the duties of Treasurer, he carries with him the affectionate respect and gratitude of his brother members. I congratulate the members on having secured his services as a member of Council.

Mr. James Parkinson, at the request of the Council, has undertaken the post up to this time. You have to-night confirmed the Council's appointment, and we must all hope that under his management the financial condition of the Society may every succeeding year be in as flourishing a state as at the present moment ; for we have,—

Invested	£752	19	8
Balance at Banker's.....	243	5	10
Amount on Deposit Account	200	0	0
<hr/>			
Making a total of	£1,196	5	6
<hr/>			

Whilst upon this subject, I may state that Members, whose subscriptions due in November are not paid by the 31st of December, will not receive the "Transactions" of the Society.

The Librarian informs me that, owing to the thorough inspection of the Library last year, he does not think it advisable to close it so soon again for the same purpose, as considerable interruption is caused thereby, and as the Library is in good order. The new regulations of the Council for allowing the Students of the Dental Hospital to use the Library have quite answered their purpose, and those gentlemen have fully appreciated the privilege. The plan was originally proposed by the first Librarian, Mr. Fletcher, and the Council have from time to time turned their attention to it; but it was somewhat difficult to make such arrangements as would give real advantages to the Students without interfering with the wants of the Members of the Society. This object has, however, apparently been obtained; and not merely has a large number of books been applied for by Students, but the number of Members of the Society who have used the Library in 1872 is more than four times that of those who exercised this privilege in 1871.

The chief donors to the Library in 1872 were, Dr. Bogue, of New York; Dr. Hitchcock, of Boston; Dr. Magitot, of Paris; Dr. Belisario, of Sydney; Messrs. Charters White, C. J. Fox, and Thomas and Henry Rogers of London; the Royal Society; the College of Surgeons of England; the Royal Institution of Great Britain; the Royal Medical and Chirurgical Society; the Pharmaceutical Society; the Philosophical Society of Glasgow; and the Smithsonian Institute of Washington. Mr. James Parkinson has kindly promised to present the Library with the "Microscopical Journal" in future, and the Librarian will be much obliged to any Gentleman who will present any back numbers of the "Journal of Anatomy and Physiology," except Nos. I. and II., which he will be happy to contribute himself. He again strongly urges any Members who have imperfect sets of the "Transactions," and who desire to complete them, to apply either to himself or to the sub-Librarian immediately, as the back volumes are becoming scarcer every year.

Whilst on the subject of the Library, I beg to congratulate the Society on possessing so efficient a Librarian, and to tender personally my best thanks to Mr. Rogers for the aid and assistance he has afforded me during my year of office, and for the very able manner in which he has performed his duties.

The difficult task which Mr. Sercombe had so long and so ably performed of editing the "Transactions" has during the past year been in the hands of Mr. Coleman. The wisdom of the Council in requesting this gentleman to undertake this office is clearly shown both in the regularity with which the numbers have been issued, and the admirable manner in which they have been brought out, and I should but imperfectly perform my duties if I omitted to offer him our warmest thanks.

The Museum is the next point to which I desire to direct your attention. The Curator, Mr. Charles S. Tomes, had a very difficult task before him on entering upon his duties, but he has reduced the chaotic mass to order; has arranged and classified the scattered materials, and published an excellent catalogue. This, considering the condition of the Museum when Mr. Tomes took office, is an ample proof of the sacrifice of time he must have made in the interests of the Society, and for which we cannot sufficiently thank him. Mr. Tomes informs me that the Museum has, during the past year, received donations far more numerous than in preceding years: many of these, he believes, in response to a letter published in the "British Journal of Dental Science." Large contributions of skulls, &c., have been received from Dr. Belisario, of Sydney; and from Mr. D. R. Eden, of Brisbane; and a number of objects of interest have been presented by various members of the Society and the profession: a complete list of which will be found in the number for December, 1872, of the "British Journal of Dental Science."

Gentlemen, to the Secretaries our best thanks are due for the unwearied zeal with which they have worked for our interests. It was not until I occupied this chair that I had an idea of how much labour falls to their lot,—of how much the Society is indebted to them. I would my power of language were sufficient to enable me adequately to thank

Messrs. Gregson, Harding, and Fox for all they have done for the Society.

The review of the past year is in such a case as ours generally accompanied with regret, inasmuch as of those who were in our ranks at its commencement, some must in all probability have passed away. This year I am thankful to say death has taken from us but one member, who, though not personally known to most of us, was highly esteemed by us all as a practitioner, and whose death we all deplore. I refer to Professor S. W. Dentz, of Amsterdam, who was elected a corresponding member of this Society in 1857, and died in the spring of this year.

In concluding these brief remarks, it is well we should look to the future. You are doubtless all aware that for some time past the Committee of the Dental Hospital has been desirous to find premises more adapted to the increasing needs of the Institution, which has outgrown its present accommodation, provided that in so doing they could insure that our Society should find its home in the same premises. The Dental Hospital may fairly be considered as owing its existence mainly to this Society, and in any arrangements it may have to make its Committee are most desirous to consult our interests and wishes. To ascertain how far the Society would acquiesce in the proposed change, a special meeting of the Council was convened, at which the subject was brought under discussion, and it was decided that this Society was ready to act with the Committee of Management of the Dental Hospital, and to remove to the proposed new premises. The arrangement is not yet completed, but should it be carried out we must look ere long to a change of residence.

In the hands of the promoters of this change, you may rest assured that the interests of both the Society and the Hospital will be equally keenly looked after.

One last glance at the past. Our finances were never in a more flourishing condition ; our Library is in better order and more generally used ; our Museum is increasing every year, and promising to be (if it is not now) for what it professes to embrace, unrivalled. I am not aware of any shadow having been cast across our path during the year, and I hope that my

excellent successor, Mr. Sheffield, will be able at the conclusion of his Presidentship to present to you a still more pleasing picture.

And now, Gentlemen, before retiring from this chair, allow me to thank you warmly for the kindness, co-operation, and assistance I have ever received at your hands ; to wish you individually and collectively every good ; and to assure you that I shall ever consider the year in which I acted as your President as one of the happiest of my life.

Mr. PARKINSON was sure he should but echo the wishes of all present if he proposed that the best thanks of the Society should be accorded to their esteemed President for the manner in which he had fulfilled the duties of that post during his term of office. Those who had met him in the Meetings of the Council were perhaps the best qualified to estimate his zeal and interest towards the good of the Society. No president could have more faithfully discharged his trust, and for this he deserved the gratitude of the Members.

The proposition having been carried by acclamation, the PRESIDENT said he trusted he was fully sensible of the kindly manner in which Mr. Parkinson had proposed the vote of thanks, and in which the proposition had been received by those present. The difficulties and responsibilities of being the President of such a Society were by no means light ones. He had found that so, but he had this satisfaction : he had tried his utmost during his term of office to advance the best interests of the Society, and they (the Members) had pronounced him worthy of a vote of thanks for the same.

Mr. T. A. ROGERS would beg them to remember that their best thanks were due also to their Treasurer, Mr. Parkinson, the duties of whose office were by no means light, nor at all times the most agreeable ; and also a vote of thanks to their late President, Mr. Harrison, whose ill-health had unfortunately deprived them of that constant attendance to which they had so long been accustomed.

Mr. COLEMAN would second both those resolutions. With regard to their late Treasurer, he must add there was no

individual in the Society who more thoroughly deserved their gratitude than did Mr. Harrison, for the long and valuable services he had rendered to it.

These resolutions being carried, Mr. OAKLEY COLES said votes of thanks were due, and must be passed to the Council and other officers ; the Secretaries, Librarian, Curator, and the Editor of their "Transactions" were especially entitled to the same.

The CHAIRMAN, having conveyed the thanks of the Society to those included in Mr. Coles's proposition, gave notice that at the next meeting a paper would be read by Mr. Warwick Hele on "The Automatic Supply of Nitrous Oxide," and then vacated the chair.



*The Treasurer in Account with THE ODONTOLOGICAL SOCIETY of Great Britain.
Financial Statement for the Year ending October 31, 1872.*

D.R.		£	s.	d.
To Balance at Bank at the end of the year, terminating October 31, 1871.....		277	6	9
Balance in Treasurer's hands at the same date for Petty Cash Account.....		20	9	7
Entrance Fees for this year.....		19	19	0
Annual Subscriptions for this year.....		319	4	0
Donation from Mr. Rymer.....		1	1	0
Sale of "Transactions"		9	15	0
Interest on Deposit Account		2	14	1
Dividends on Stock		21	12	0
<hr/>				
C.R.				
By Rent paid for the year				
Wyman and Son's account for printing and publishing "Transactions"		191	4	6
Ditto for other Printing, &c.		53	10	0
Postage, and Receipt Stamps		4	15	0
Stationery		1	9	9
Library		10	19	0
Museum		17	18	0
Refreshments		21	1	10
Sundry Petty Payments		1	11	10
Dividends on Stock reinvested		21	12	0
Balance, viz. :—				
At Bank (current account)			85	6
Ditto, at Deposit			200	0
In Treasurer's hands (petty Cash)....			12	13
		297	19	6

£672 1 5

Total Receipts for the year	.....	£352	13	1
Total Expenditure for ditto	.....	352	9	11
Receipts over Expenditure	.....	£0	3	2 *

TOTAL ASSETS OF THE SOCIETY.

Stock in the New 3 per Cents.	£752
Cash in Banker's and Treasurer's hands	£297
	19 8
	19 6

Examined and found correct, November 20th, 1872.

G. A. IBBETSON,
E. HOLBOROW KING, } *Auditors.*

THOMAS UNDERWOOD, *President.*
GEORGE GREGSON, *Hon. Sec.*

* There is owing to the Society at this date a large sum for Annual Subscriptions from old Members, and Entrance Fees and Subscriptions from new Members, the great bulk of which, I believe, will still be paid—so that the actual surplus of the year will be considerably more than this.—W. A. HARRISON.

STATEMENT OF ELECTIONS, DEATHS, RESIGNATIONS, &c., OF
MEMBERS DURING THE PAST YEAR.

	Resident.	Non-resident.	Honorary.	Corre- sponding.
Elections	3.....	5.....	0.....	0
Deaths	0.....	0.....	0.....	1
Resignations	0.....	0.....	0.....	0
Lapsed Memberships ..	4.....	4.....	0.....	0
Number of Subscribing Members (Resident)				83
„ „ „ „ (Non-resident)				150
„ „ „ „ „				23
„ „ „ „ „				21
				<hr/>
TOTAL.....				277

GENERAL MONTHLY MEETING,

Monday, February 3, 1873.

ISAAC SHEFFIELD, Esq., PRESIDENT, IN THE CHAIR.

THE Minutes of the last Meeting were read and confirmed.

The PRESIDENT then said—

GENTLEMEN,—On few occasions of my life have I found myself placed in a situation of so much difficulty and embarrassment as the present ; and had not some of my friends been pleased to put a much higher estimate upon my pretensions and qualifications than I do myself, for the distinguished office to which you have in so kind and flattering a manner elected me, as President of your Society, I should certainly have shrunk from its duties and responsibilities, and should not have had the honour of addressing you in that capacity and from this place, which I feel therefore I occupy, not so much in consideration of any merit of my own, as a tribute of respect for a name which I may be permitted to say has been long and honourably associated with the profession.

There are few men who feel indifferent to the good opinion of their fellows (and I do not know that such, if such there be, are to be envied), and who are not actuated by a desire to possess the esteem and favour of those with whom they are on terms of frequent and familiar intercourse, more especially those whom congeniality of taste and similarity of pursuits best qualify to form a right judgment of their claims to regard.

Be this, however, as it may, it would be affectation on my part to deny that this conspicuous mark of your kindness and confidence is to me a source of sincere gratification and pride.

In justification of these sentiments, I need only refer to the high intellectual cultivation and polished manners, the courtesy and refinement, the practical knowledge and distinguished professional standing of many names enrolled among the members of this Society.

So that when I look at the list of those who have preceded me in this office, I am the more strongly impressed with the truth of the axiom—"Onerosum est succedere Bono Principi," and with a humbling sense of my own insufficiency,—and constrained to solicit your indulgent consideration; and at the same time to hope that you will accept my earnest, however imperfect, endeavours to discharge the duties you have imposed upon me as an apology for any deficiencies and shortcomings which I may exhibit in the performance of them.

It might not be irrelevant to the occasion of our meeting to take a retrospective view of the history of your Society from its foundation, when it comprised but a few of the more eminent members of the profession, till, swelling year after year by additions to its numbers, it attained its present magnitude and importance, commanding the consideration and possessing the confidence and respect of the public; also to trace the progress of the profession (or art) itself, from its first rude essays to its development, by successive stages of improvement, into the more perfect methods and more scientific processes of the practice of the present day.

But this would open a field of inquiry much too wide for the time at my disposal to enter upon, even if I had the power to do justice to the subject.

It is interesting, however, to consider from what unpromising beginnings the most useful productions of art have arisen, and to contemplate any art rising gradually from its first mean state by the successive labours of innumerable minds. It may illustrate my meaning to consider the first hollow trunk of a tree, in which a shepherd or a savage could scarce venture to cross a brook swollen by a shower, expanded into a ship of war, impelled by the irresistible force of steam, attacking

fortresses, setting winds and waves at defiance, and visiting the remotest parts of the globe.

Again,—who, when he first saw the sand or ashes by a casual intensity of heat melted into a metallic form, rugged with excrescences and clouded with impurities, would have imagined that in this shapeless mass lay concealed so many of the conveniences and comforts of life?

Yet by some such accidental liquefaction was mankind taught to procure a body at once solid and transparent, one which might admit the light of the sun, and exclude the violence of the wind; which might extend the sight of the philosopher to new ranges of existence, and charm him at one time with the unbounded extent of the material creation, and at another with the endless subordination of animal life; and (which is yet of higher importance) might supply the decay of Nature and succour old age with subsidiary sight.

Did he consider that he was facilitating and prolonging the enjoyment of sight, enlarging the avenues of science, and conferring the highest and most lasting pleasures; enabling the student to contemplate nature, and Beauty to behold herself?

In further illustration of the subject which I have ventured to consider, I may be allowed to refer to one of the more refined and elegant arts, that of painting; and to say that Raphael—to whom the consentient testimony of 350 years has assigned, and I think most justly, the first place among painters—would not have attained that distinguished pre-eminence, nor would the art itself have arrived at that perfection which it reached under his hands, but for the works of the great masters who more immediately preceded him,—Angelico da Fiesole, Masaccio, Filippino Lippi, Fra Bartolomeo, and his own master, Pietro Perugino.

Of the works of these masters, especially those of Masaccio, he did not hesitate to make large and frequent use, to the extent even of copying, not heads only, but whole figures, not indeed, in the spirit of a servile imitator or plagiarist (his facility of invention was too inexhaustible to render such a practice necessary, and his known wealth, as Sir J. Reynolds observes, was so great, that he could borrow without loss of credit), but by

incorporating them with his own conceptions ; and the skill with which he adapted them to a purpose so entirely foreign to that from which they were taken, made them absolutely his own.

In confirmation of what I have stated, I may be excused from remarking that a well-known connoisseur—my brother, I mean—has in his possession a picture, in monochrome, of a Madonna and Child, by Filippino Lippi, a painter anterior to Raphael, which, with certain technical defects belonging to the period, for beauty of form and sweetness of expression, for deep devotional feeling and purity of sentiment, for the manner in which, I may almost say a heavenly personage has been translated into an earthly form, is equal to anything ever executed by Raphael himself.

As bearing also on the matter under consideration, you will permit me, perhaps, before closing, to detain your attention for a few moments in a more exalted field of mental labour, one in which the most wonderful triumphs of human intellect have been achieved—I allude to Astronomy—and say that had not the way been prepared by the labours of the illustrious men who preceded him, for instance, Galileo's great improvement and first application of the Telescope to astronomical purposes, namely, the observation of the Satellites of Jupiter, still more by the three famous laws of Kepler, namely, the motions of the planets in elliptical orbits, the proportionality between the areas described and the times of description and the relations between the squares of the perivheic times and the cubes of the distances, who also not only conjectured that some power resided in the sun by which the motions of the planets were produced, but also that this power diminished as the square of the distance of the body on which it was exerted increases ;—it may be doubted whether even Newton—a name which the world (the philosophical world at least) has combined to regard and venerate as one almost more than mortal—with *his* profound and comprehensive genius, his vast reach and amazing grasp of thought—would ever have made his immortal discovery of the law by which the material universe is governed, the boundaries of human knowledge enlarged, and all the component parts of the

system enabled to perform their motions with such marvellous order and regularity.

Still, to our renowned countryman the merit and the honour of that, the grandest exploit of Science and the highest exertion of the mind of man, are due :

“ Nature and Nature’s laws lay hid in night :
God said, let *Newton be*, and all was light.”

And, gentlemen, may we not base that sublime instance of abstract reasoning and grand induction, which enabled Adams, concurrently with Leverrier, to conjecture and discover the existence of the planet Neptune, from a slight aberration of Uranus in describing his orbit, on the discoveries made by his great predecessors in the field of Science ?

Of ourselves, gentlemen, there are perhaps but few—

“ Whose souls proud Science ever taught to stray
Far in the solar path or Milky Way.”

Our lot is to labour in a less noble, although not less useful sphere.

But the most brilliant actions are not always the most beneficial, and if any *art* is to be estimated by its usefulness, there is hardly one better entitled to the gratitude and respect of mankind than our own ; since no other (in the progress the mechanical arts have made during the last quarter of a century) which, directed by intelligence, has contributed more to the real wants and material comfort of man—

Then, as the poet truly sings :—

“ Honour and shame from no condition rise ;
Act well your part—there all the honour lies.”

The Philosopher may justly be delighted with the extent of his views, and the artificer with the readiness of his hands, but let the one remember, that, without practical performances, refined speculation is an empty dream ; and the other, that, without theoretical reasoning, dexterity is little more than a brute instinct.

The precept inculcated in the couplet I last quoted supplies, then, at once a motive and a rule of action for ourselves.

As citizens of a civil community and as Professors of a liberal art, we have each a double mission to fulfil, and on the manner in which we perform it, not on the situation of life in which our lot is cast, our own true honour and happiness, and, in a great measure the well-being of others, depend ; and if the final award follow the character, the circumstances under which it is formed are of little moment.

"It matters not," says Rousseau (who, however, is not a teacher of morality to be recommended), "what sort of trials we have, provided they produce their proper effect."

Every one, therefore, should consider himself as entrusted, not only with his own conduct, but with that of others, and as accountable, not only for the duties which he neglects or the crimes that he commits, but for that negligence and irregularity which he may encourage by his example or inculcate by his conversation.

Every man, whatever be his station, has, or endeavours to have, his followers, admirers, and imitators, on whom his conduct must exercise an influence for good or for evil,—an influence of which the limits cannot be defined, but may prove (which is a solemn consideration) co-extensive with duration itself, and be a cause of exultation or anguish for ever.

He ought, therefore, not only to avoid doing what is wrong, but the very appearance of wrong ; and not only to practise virtue, but to applaud, support, and recommend it.

The Profession of which we are members has likewise its claims upon us.

Let us then, gentlemen, endeavour each to act well his part, to labour earnestly and conscientiously in his own peculiar sphere of life, as those who must hereafter give account, and strive as much as in him lies, by a faithful discharge of the duties of the station assigned to him, to make his art (what it really is capable of being made) a means of usefulness to his fellow-beings, and thereby elevate and sustain the character and position which the Odontological Society of Great Britain has taken among the more liberal professions and learned bodies, which are among the ornaments of this great country, and have contributed so materially to advance it to that high

state of refinement and culture which has placed it at the head of the civilized nations of the world.

I have to thank you, gentlemen, for the patience with which you have given your attention to my feeble efforts to entertain you for a few moments, and to apologise for having taken up so much of your time which might have been more agreeably and profitably spent, perhaps, in listening to the papers which Mr. BRAINE and Mr. HELE kindly intend to read to you.

The following gentlemen were elected Members of the Society :—

Mr. THOMAS FRANCIS UNDERWOOD, M.R.C.S., 14,
Gower Street, resident.

Mr. JOHN O'DUFFY, Dublin, non-resident.

Mr. WILLIAM EDWARD KEELING, Devizes, non-resident.

Mr. ROFF KING, Shrewsbury, non-resident.

Mr. F. WOODHOUSE BRAINE,

Mr. G. H. BAILY, and

Mr. W. BEADELL BACON, having signed the obligation-book, were admitted Members of the Society.

The following donations to the Museum were announced :—

Glass Case, containing Mineral Teeth and gum-work ; showing improvement in manufacture from 1796 to present time—by Mr. ROBERT HEPBURN.

A Box, containing several Skulls of Monkeys—by Mr. O'MEARA, of Simla.

A Stuffed Rabbit, having the incisor teeth very elongated—by Mr. F. BROWNE-MASON, of Exeter.

A Model, showing supernumerary Tooth of uncommon form—by Mr. C. J. FOX.

A mass of Necrosed Bone, containing rudimentary teeth from inferior maxilla of a child aged six years : the sequestrum had become detached and was removed, after incision of the soft tissues, within the mouth—by Mr. SEWILL.

Mr. DENANT exhibited an appointment-book devised upon a new and convenient form,

Mr. COLEMAN exhibited for Mr. David Hepburn, jun., a specimen of malposition in a right superior cuspidati tooth, obtained from the dead-house of the Middlesex Hospital. The tooth was lying in the horizontal position, and just below the floor of the nares.

Mr. COLES exhibited, on behalf of Mr. Stokes, jun., an improved form of Mirror. A curve in the handle prevented any stretching of the patient's mouth—a condition not unfrequently followed by soreness of the lips.

Mr. WOODHAM BRAINE, after thanking the Society for the honour they had done him in electing him an honorary member, said that when the intelligence of the unfortunate alleged death from nitrous oxide at Exeter had reached him, he thought he could show his appreciation of the kindness shown him by the Society in no better way than by at once going to Exeter and ascertaining the fullest particulars of the case, and laying the information thus obtained before the Members at their next meeting. Mr. Braine then read the following paper, which had been prepared by Mr. Browne-Mason in conjunction with Drs. Drake and Pattinson :—

Alleged Death from the Effects of Nitrous-Oxide Gas. By Mr. BROWNE-MASON, in conjunction with Drs. DRAKE and PATTINSON.

THINKING that the members of the Odontological Society of Great Britain will like to hear full particulars of the late fatal case following the administration of nitrous-oxide gas that has occurred in my practice, I forward the subjoined report, prepared in conjunction with Drs. Drake and Pattinson, which my kind friend Mr. Braine has promised to read for me in my unavoidable absence; and I should like to take this opportunity of thanking the large number of my brother practitioners who have so kindly expressed their sympathy with me under the peculiarly trying and painful circumstances in which I have been placed.

On the 22nd of January, a lady, then residing at Seaton, near Axminster, Devon, came to consult me about the removal of an upper second molar on the left side of the mouth. The patient was thirty-eight years of age, had generally enjoyed good health, and there was no reason for believing that any thoracic disease existed. She was of middle height, stout, with a peculiar cast of countenance, having prominent eyes, a very flat superior maxillary arch, the lower maxilla being very underhung. The nasal arch was somewhat flattened, and this, together with

her having chronic elongation of the uvula, and considerable enlargement of both tonsils, interfered slightly with her breathing, rendering it at times somewhat loud—that sort of breathing which may be expressed by the term “snorting,” particularly after much exertion, such as going upstairs. On the day in question she was unusually well and in good spirits. On inspecting her mouth, I found considerable disorder in the arrangement of the teeth. On the left side of the upper jaw the second bicuspid was situated, with what should have been its posterior surface in juxtaposition with, and against the lingual surface of, the second molar, which was the tooth to be extracted. This tooth had been the subject of so much caries that a probe could be passed right through from the anterior to the posterior surface. The pulp was gone, and there was excessive periosteal inflammation. The bicuspid being quite sound, I was desirous of saving it, expecting that in time, after the removal of the molar, it would drop into the dental arch and become useful. It was not possible to remove the tooth with the ordinary forceps without disturbing the bicuspid; so I decided on cutting off the crown of the diseased tooth with the excising forceps, then separating the fangs, and removing them singly.

The patient, who had never taken gas before, being accompanied by her brother-in-law, Dr.

Pattinson, who was also her medical attendant, desiring to be placed under the influence of gas, was seated in a Morrison's chair, which was inclined backwards, the face being turned somewhat up, to enable the upper teeth to be conveniently reached, and I proceeded to administer it in my usual manner, as follows:—Having ascertained that the patient had perfect freedom for breathing, the dress being open at the neck and throat, and quite loose elsewhere, I filled a gasholder of six-gallon capacity from one of Ash's fifty-gallon iron bottles containing liquid gas. I used the ordinary face-piece usually supplied with the apparatus, but without the supplemental bag: the gag used on the occasion (an ordinary wooden one) is now shown you, and was inserted between the first molar and the second bicuspid in both jaws on the right side of the mouth, and well locked by the cusps of those teeth. I gave Dr. Pattinson charge of the pulse at the left wrist. After the patient had taken some half-dozen respirations, he exclaimed that the pulse was not so rapid, but he states that its volume did not vary. I removed the face-piece, saying, "Let us do without it;" and accordingly cut off the crown of the tooth with the excising forceps, which of course did not hurt the patient, as the pulp was gone; but on my thrusting this spear-pointed instrument into the exposed pulp-cavity, and with a twist splitting the fangs, so

much pain was produced, owing to previous inflammation of the periosteum of the fangs, that the patient declared she could not bear any further operation unless more gas was given her. On rinsing out the mouth, the water was returned tinged with blood. An interval of ten minutes took place, during which the patient was somewhat hysterical; and the bleeding having quite ceased, the same gag was replaced in its former position, and the inhalation resumed. Dr. Pattinson cannot agree that the bleeding had *quite* ceased—it was never other than slight—but he thinks there must have been a minute quantity of blood exuding from the gum during the second inhalation. At Dr. Pattinson's request, I now took charge of the pulse at the right wrist, while he held that at the left. The patient took the gas well, but just before quite losing consciousness she raised her right hand and pushed off the inhaler, which I replaced and continued the inhalation. Dr. Pattinson states it as his impression that no more gas was given after the inhaler was pushed away, the eyes never having closed. I noticed that the pupil of the right eye was slightly dilated, and on touching the conjunctiva reflex action took place, showing that this membrane was not completely insensible. On removing the inhaler I am quite certain no blueness existed, and finding the stumps exposed and uncovered with blood, I proceeded to operate, and attempted to seize the

palatine fang with a pair of stump forceps ; but, the edge giving way, I dislodged it with an elevator, with which I afterwards easily removed the outer fangs, the whole operation lasting about three-quarters of a minute. I received all the fragments of tooth in my fingers, and feel quite sure that nothing passed backwards into the throat. I then saw for the first time blueness of the lips, but Dr. Pattinson had noticed that during the operation the ear on his side was bluish, and on looking at the face saw blueness there also ; but he says he did not mention it, as he had heard of this discoloration occurring at gas administrations. The symptoms now became alarming ; the features appeared puffy and swollen, the eyeballs protruding, the breathing thick and stertorous, the point of the tongue thrust between the teeth, but no convulsive movements were visible. The pulse and the appearance of the pupils at this period were not observed, attention being paid to more urgent matters. An old attendant, who was in the room, exclaimed, "Take out the gag ; she is choking !" This was the first suspicion Dr. Pattinson had that anything was going wrong. The gag was then forcibly removed ; it needed great force to separate the jaws, and possibly it was then chipped as you now see it, for it was perfect when inserted, and exactly where I placed it at first. Mr. Braine, on examining the gag ten

days after the operation, pointed out to me the broken surface, which I had not seen before; but never having looked at it since, the piece may have been broken accidentally after its use on this occasion. I then thrust the head forward to see that no blood got into the throat, and passed my finger down over the tongue to draw it forward, as it had now dropped back. From this time Dr. Pattinson thinks there was fixity of expression, and no further entrance of air into the chest. The window was thrown open, and the face dashed with cold water. I now left the patient in Dr. Pattinson's hands, to fetch further assistance. Whilst I was absent he continued his endeavours, and applied strong ammonia to the nostrils: there appeared to him to be some sensibility, inasmuch as she seemed to recoil slightly from the pungency of the ammonia. He then noticed about a tablespoonful of water lying at the back of the mouth, which had lodged there during the time he was dashing it over the face, and he drew the head forwards to allow it to run out. After an absence of about three minutes I returned with Dr. Drake, for years past one of the most eminent physicians of the city, and at the present time consulting physician to the Devon and Exeter Hospital. At this time the pulse was felt in both radials, and in the left carotid. I substituted the handle of the forceps now exhibited for my finger to keep the tongue

forward, for the purpose of allowing freer access of air, and Dr. Drake performed artificial respiration, by alternately pressing on the thorax and then allowing it to expand by its own elasticity, at the same time raising the arms; and this was continued until the pulse ceased, but the breathing sounds produced were only those of expiration. When Dr. Drake came into the room he found the patient in the position which has been described. Her countenance was dusky, face swollen, eyes projecting, tongue in the mouth, mouth open. He put his finger as far as he could into the throat, to find that nothing interfered with the access of air. She made three or four faint expiratory movements, accompanied by a slight sound. During this time the pulse beat regularly, and continued to do so nearly two minutes after all respiratory movements had ceased. The blueness about this time began to disappear. All our efforts were unavailing, the pulse ceased to beat, and death ensued. Two hours and a quarter after death the blueness had entirely disappeared.

It is much to be regretted that a *post-mortem* examination was not permitted, as it would doubtless have cleared up many points which must now ever remain in obscurity.

Dr. DRAKE said it was quite impossible for him, seeing her in a dying state a few moments only before death, to form any positive and precise

inference as to the immediate cause of death, but his impression was as stated by him at the inquest.

Mr. WARWICK HELE then read a paper "*On the Automatic Apparatus for the Administration of Nitrous-Oxide Gas.*"

DISCUSSION.

Mr. BRAINE said he rose with pleasure to congratulate Mr. Hele on the clever paper he had just read, and felt sure that all who had listened to it must have been struck with the remarkable ingenuity of the appliances therein described. Were he at any future time to be so situated as to have his store of gas a long way off, he should nnhesitatingly adopt the method proposed by Mr. Hele, and he would go a step further and say that the plan of registration adopted by that gentleman was the most perfect that had yet been introduced. With the permission of the President, he would like to notice one or two points in the report of Mr. Browne-Mason which he had read. The first to which he would call attention was the fact that the patient had considerable enlargement of the tonsils, accompanied with relaxed uvula. To this circumstance he attached no very great importance, as in his practice he had met with many such cases ; still that condition of the tonsils and uvula generally produced troublesome coughing, which he found much relieved by changing the position of the patient's head. Mr. Browne-Mason, in this unfortunate case, could not be too strongly congratulated on the foresight he had shown in having present during the administration of the gas Dr. Pattinson ; and he thought, after what had just occurred, it would be an act of extreme imprudence upon the part of any dentist to place a patient under the influence of this or any other anæsthetic without having present at the same time some experienced person to watch its effects during the period of the operation. In respect to this case, he thought all would agree that it was *during* the operation that the symptoms of apnœa commenced ; for at the time the inhalation was discontinued "no blueness existed, and the conjunctival membrane was still sensitive ;" and the operation was described as lasting three-quarters of a minute. Now with this amount of

anæsthesia at the commencement, the patient, had all been well, would have in all probability regained consciousness before the operation was concluded. The authors of the paper had distinctly told him that they had not contributed any information directly to a leading medical journal, which last week contained a long tirade against the nitrous oxide, and which had drawn its conclusions, he presumed, from the report of the inquest, which was a very imperfect one, and one greatly calculated to mislead. The profession, he trusted, would not be biassed by those conclusions founded upon imperfect data.

Mr. SERCOMBE said he trusted Mr. Hele would not feel slighted if his paper did not receive at their hands that amount of attention which the ingenuity of the apparatus he had devised warranted ; but the attention of the Society was naturally absorbed in the matter contained in the paper read by Mr. Braine. They must all feel very grateful to Mr. Braine for the trouble he had taken in getting the full particulars of the death of Miss Windham at Exeter. When the gag was handed round the room, it was no small relief to his mind to see a large splinter of wood missing from it, for it at once occurred to him that here was a cause that would readily account for the accident. Up to that moment he had been compelled to admit that this was a *bonâ fide* case of death from nitrous oxide. Mr. Braine had naturally abstained from saying much upon this point in the presence of the gentlemen under whose hands the unfortunate accident occurred, but he (Mr. Sercombe) thought that, in fairness to the public, they were bound to express their feelings openly upon this question. The facts now presented appeared to him to prove that death in this case occurred, in all probability, from a splinter of wood, bitten off from the gag, finding its way into the larynx and causing spasmodic closure of the glottis.

Mr. COLEMAN said either of the causes of death suggested, viz., blood getting into the trachea, or a foreign body into the larynx, might be the correct one. He had noticed one point in the paper ; viz., that the patient suffered from enlarged tonsils. On administering the gas to patients so affected, he had seen unpleasant symptoms supervene, apparently from a large

quantity of thick ropy mucus secreted during the inhalation, and interfering with respiration during the recovery of the patient. He did not, however, believe that the death arose from this cause, or from those suggested by Mr. Braine and Mr. Sercombe. He was inclined to the opinion that the cause of death was in this case apoplexy. Some years ago, in a paper printed in the St. Bartholomew's Hospital Reports, he had stated his belief that death from this cause would sooner or later occur during the administration of nitrous oxide. The state of venous congestion witnessed in plethoric persons led him to infer that great danger would exist in the case of patients having fatty degeneration of the vessels of the brain.

Mr. HELE said he could not forget a case which, some months ago, caused him the greatest anxiety, the patient nearly losing his life through administration of the gas. Before inhaling it he was examined, and appeared quite free from either lung or heart disease. There were no unusual conditions manifested during the inhalation, and the operation was a simple one. After a lapse of thirty seconds from discontinuing the gas, respiration became more and more laboured, until it appeared to cease. Artificial respiration was resorted to, and happily the patient was restored.

Mr. COLEMAN—Was the patient livid or otherwise?

Mr. HELE—Quite pallid, as if dead.

Mr. COLEMAN, then, believed that it was a case of syncope, rather than arrest of respiration in consequence of the gas.

Mr. BRAINE quite concurred with Mr. Coleman, and said that the stimulus of artificial respiration no doubt aroused the heart's action.

Mr. SEWILL said that whatever opinion they might form as to the desirability of administering nitrous oxide upon the plan adopted by Mr. Hele, they must give him credit for remarkable ingenuity. He confessed he had never employed so complicated an apparatus. He had tried several forms, and the conclusion he had arrived at was, that the simpler the

apparatus employed, the better. He now invariably adopted the plan of having the supply of gas as near to the patient as possible, and conveyed to the mouth through a tube of large diameter ; hence no efforts were demanded upon the part of the patient in obtaining the agent. With regard to the case at Exeter, he fully concurred in the remarks that had fallen from Mr. Braine. The gas ought only to be administered by those well able to cope with an emergency. Accidents with gas appeared quite within the range of probability ; they would most likely occur from suffocation, and should be met with prompt and energetic measures.

Mr. SERCOMBE thought it would be a great satisfaction to Mr. Browne-Mason if the Meeting generally expressed an opinion to the following effect ; viz., "That they deeply sympathized with him in the trying position in which he had been unfortunately placed, and that they fully exonerated him from any blame in the matter." Death was, he thought, in all probability due to a splinter of wood getting into the larynx, for which Mr. Mason could in no way be responsible.

Mr. SEWILL having seconded the proposition, it was unanimously agreed to by the meeting.

The CHAIRMAN having conveyed the thanks of the Society to Mr. Braine, Mr. Browne-Mason, Mr. Hele, and to the respective donors and exhibitors upon the occasion, adjourned the meeting to Monday, the 3rd of March, when Mr. Sercombe will give a description of Morrison's Dental Engine, and the Committee appointed to investigate the merits of Mr. Fletcher's new Oxy-chloride Filling will furnish a preliminary report.

The Automatic Supply of Nitrous Oxide.

By WARWICK HELE.

MR. PRESIDENT AND GENTLEMEN,—

A METHOD of administering nitrous oxide, so as to produce what is equivalent to an atmosphere of that agent, has lately been brought before the Society by my friend Mr. Palmer. As the means then advocated received some hostile criticism, and errors arose in the conception of the design, I propose to answer the objections taken, and afterwards introduce to your notice the apparatus and method I have latterly employed; a system founded upon that so excellently described by Mr. Palmer, but free of its sources of failure.

In attempting to answer the question, “How are we to administer nitrous oxide as an atmosphere?” I am content to concede that when it is possible to administer direct from a gasometer of tolerably large capacity—say 100 gallons—and the patient is in close proximity thereto, the difficulty of arranging a flow of gas commensurate to the patient’s requirements is easily overcome; the removal of a slight portion of the counterpoise being sufficient to drive the gas freely along the outlet pipe, and to overcome the friction of its walls. But it is apparent that with increased distance between the gasometer and

the patient, or with decrease in the capacity of the gasometer and its outlet, so is increased the difficulty of supplying gas as needed by the patient breathing. And this difficulty of supply becomes aggravated as the patient approaches insensibility, when the breathing is most rapid and forcible, and the flowing pressure of gas diminished by the bell of the gasometer being lower in the water than at the commencement of the administration.

We all have had reason to thank Mr. Clover's inventive genius for his admirable method of overcoming the difficulty at this stage,—I speak of his supplemental bag,—but for a complete regulator to the flow of nitrous oxide, such as shall accelerate or retard, provide an ample supply of pure gas and yet prevent waste, in short, for such a regulator as shall produce an atmosphere, we had to look forward.

My gasometer—100 gallons capacity—being in another room from my surgery, and distant some 24 ft. from my operating-chair, I was led to perceive, by experience gained in the observation of cases, that something was necessary beyond removing portions of counterpoise; for the breathing capacity of patients can never be exactly judged. A series of experiments demonstrated that too much gas, or gas delivered at a higher speed than needed, was productive of

nearly as much discomfort as when the supply was insufficient.

After many efforts at providing some intermediate apparatus between the gasometer and patient, whereby such a supply of nitrous oxide should be yielded as to make the respiration of it no more difficult than air, I adopted that apparatus shown in diagram 1, and which was described at the October meeting. Mr. Palmer's paper has so far lightened my labour as to make a lengthened description unnecessary; but in pursuance of the scheme of the present paper I must briefly notice the principle of the regulator, and this will, I trust, conduce to the complete comprehension of that eliminated from it; viz., the automatic supply.

I was led to the adoption of this regulator by the consideration of the fact that a law governs the flow of fluids, by which they invariably take the shortest road of escape from confinement. Thus, if on a hydrant two tubes of equal diameter be fixed, with stop-cocks attached, and the more distant be first opened, the whole escape of water will be by that exit; but on opening the other stop-cock, it would be seen that the greater escape at that time is by the nearer stop-cock, and that the escape by the distant one is much diminished in volume.

An experiment of this sort would practically

illustrate the conditions governing the operation of my regulator, and would facilitate the comprehension of my description; but reference to the diagram will, I hope, make its action sufficiently apparent.

The arrows indicate course of gas.

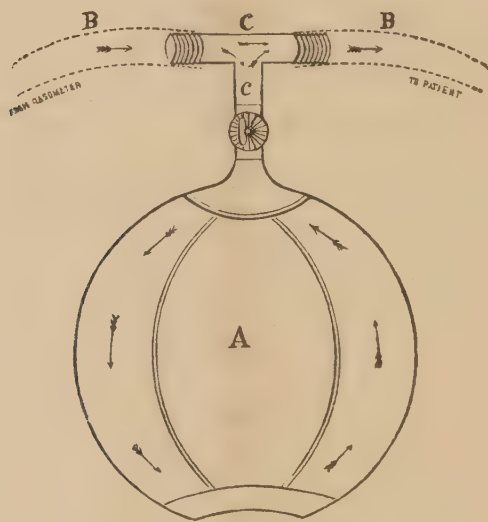


Fig. 1.—NITROUS OXIDE REGULATOR.

Drawn to Scale, $\frac{1}{8}$ real size.

The apparatus consists of a two-gallon bag (A) and a three-wayed tube (C), by which it is attached to, and dependent from, the inhaling-tube (B), and should be brought as near the patient as possible. A bag of half a gallon capacity is sufficiently large, but more liable to produce an inconvenience I shall presently describe.

When the gas is turned on from the gasometer

—with sufficient pressure to drive it freely along its main—the flow of nitrous oxide, governed by the above law, causes its escape first into the bag, when, having accumulated within to such an extent that the pressure of the bag's elastic walls overcomes the friction against the onward flow of the gas along the straight tube to the face-piece, the administration should be commenced. The fact of this condition having arrived may always be demonstrated by the ignition of the embers of a match at the two-wayed tap.

The patient obtains, in consequence of the easily contractible walls of the bag, a free supply of gas, also supplemented by the amount flowing direct to the face-piece along the straight pipe (B C B).

During the period of expiration an equivalent volume of gas to that removed by inspiration is stored in the bag, instead of being forced through the valves of the face-piece. Thus it will be seen that whilst the patient has two free supplies of pure gas, a check to waste is provided in the storage effected by the bag. This regulator therefore affords some real advantages.

I find it necessary to combat a prevailing idea that this bag regulator is only a modification of Mr. Clover's supplemental bag. The two differ so entirely that a few words will put this to

rights ; and of the supplemental bag I shall quote Mr. Clover's own description. Speaking of the face-piece and its manner of use, he says, " When a patient breathes in a rapid and forcible manner, it does not always prevent a little air being drawn in through the beard, or by the cheek falling in during inspiration. To obviate this I have added a supplemental bag, holding some 200 inches, and connected by a $\frac{3}{4}$ -inch tube and stop-cock with the face-piece." The method of action being, " When the patient begins to pant, the stop-cock should be opened. The gas received into this bag is so readily yielded during inspiration, that there is not any air sucked in under the face-piece ;" but " the supplemental bag should be compressed every fifth or sixth respiration, and allowed to refill with fresh gas, as by this means the gas will be sufficiently free from carbonic acid to allow its elimination from the lungs."

Therefore the comparison of the supplemental bag with the bag regulator proves it to be not only dissimilar, but for a different purpose.

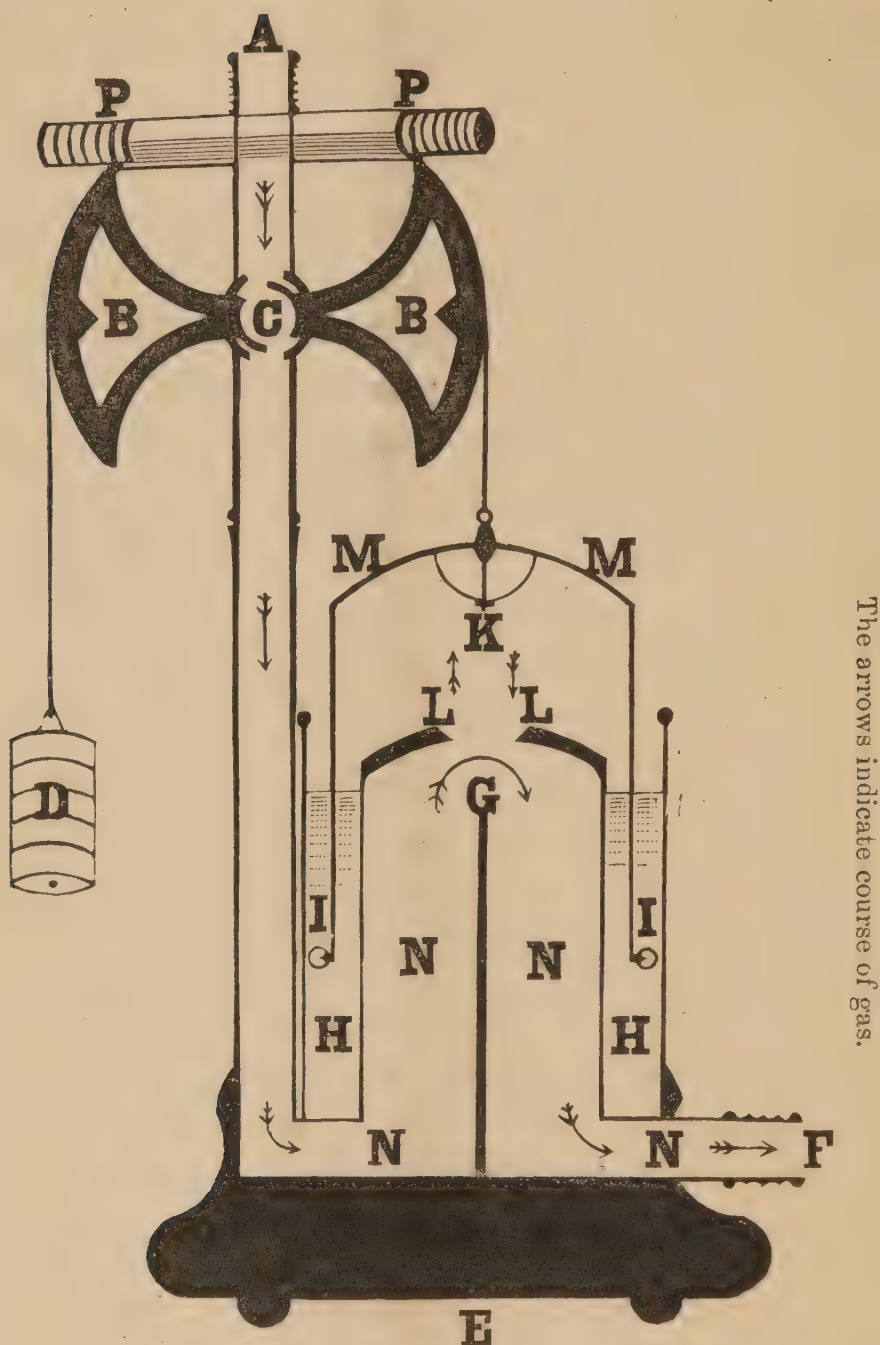
The supplemental bag affords an increased supply by accumulating respired gas.

The bag regulator affords a supplemental supply of pure gas, and regulates the direct flow.

But to the bag regulator there are some important objections. 1st. Whilst the gas stored in the bag is in a proper expanded condition, that

supplementing its amount direct from the gasometer is somewhat condensed, and comes over with a pressure not regulated by the patient's breathing capacity. 2nd. An inconvenience is occasioned by having the accumulated pure gas to return to the gasometer on the termination of the operation. 3rd. Some waste occurs with slow breathers, by the capacity of the bag being overtaxed, when the gas passes directly through the valves of the face-piece, as though no regulator were in use. 4th. During administration it is impossible to discover the rate of the consumption of gas. One and all of these objections presented themselves in actual practice, and sometimes occurred with a single case. I became, therefore, anxious to substitute some apparatus which, being based upon the theoretical action of the bag regulator, should be free from the causes of its partial failure.

After careful consideration of the causes of the partial failure, I displaced the bag in favour of a gasometer of some 200 cubic inches capacity (*see* diagram 2 on following page). I have attached to the apparatus the name "Nitrous Oxide Governor." I shall refer to it as the Governor, that my description may be concise and easily understood. Glancing directly at the Coal-gas Governor and its action, you will understand how my apparatus differs from



The arrows indicate course of gas.

Fig. 2.—NITROUS OXIDE GOVERNOR.—Sectional View.

Drawn to scale, $\frac{1}{4}$ real size.

- | | |
|---------------------------|-------------------------------|
| A Inlet to Governor. | H Water Chamber. |
| B Double Sextant. | I Friction Wheels. |
| C Stopcock revolved by B. | K Cover for Core. |
| D Counterpoise. | L Circular depression for K. |
| E Stand. | M The Bell. |
| F Outlet from Governor. | N Position of Pipes—interior. |
| G Central Diaphragm. | P Shifting Counterpoise. |

that, but how both are equally entitled to the name "Governor."

The bell of this miniature gasometer (M) is balanced by a counterpoise (D), and is suspended in water over the head (L) of the three-wayed tube reversed (N). The inlet tube (A) of the Governor, which is attached to the outlet tube of the large gasometer, supports the bell and counterpoise by means of a double sextant (B), which revolves at its centre a stop-cock (C) within the inlet tube (A). The Governor is provided with an outlet tube (N F), which permits the passage of gas to the patient.

The action of the Governor is as follows:—When the amount of gas driven over from the large gasometer exceeds the quantity inhaled by the patient, it raises the bell of the Governor, and in so doing gradually closes, and finally shuts the inlet tube by means of the sextant levers and stop-cock thereby revolved; thus preventing waste. But the quantity of gas within the bell of the Governor being exhausted by the next inspiration, the way is again opened by the depression of the bell reversing the stop-cock. In this manner the acts of respiration and the patient's breathing capacity regulate the supply according to need. As with the Bag Regulator, so here, the patient has two free sources of supply, viz., the gas accumulated in the bell of

the Governor and that flowing along the pipes. These supply the gas at a proper expansion, the core (N), or head of the three-wayed tube, being of such an increased diameter as to allow for this purpose. Here, then, we have the *Automatic Supply* of Nitrous Oxide.

Some points in the construction and action of the Governor have yet to be noticed. In case of a rapid exhaustion of the contents of the bell by a deep inspiration, in order to prevent the possibility of water being sucked from the well into the pipes, within the bell at its centre (K) there is an india-rubber pad, so secured as to accurately close the core, or third way (N), on depression of the bell. The greater the depression of the bell by the exhaustion of its contents, the more firmly is this valve secured in its action, and by the wider opening of the stop-cock (C) then produced, the freer is the passage for the direct flow of nitrous oxide to the patient from the large gasometer. You will observe, by reference to the diagram, that the whole course of the central pipe, or core, of the Governor is vertically divided by a diaphragm (G). This diaphragm acts as a director of the course of the gas. The nitrous oxide is delivered by the inlet pipe against it, and is so caused to sweep up the side until it escapes into the bell. The patient inspiring first draws from the bell, as the diaphragm intervenes between

the outlet and the inlet, thus necessitating that depression of the bell which so sensitively regulates the movements of the stop-cock (C).

If the contents of the bell be completely exhausted, and the valve (K) is in contact with L, preventing the access of water as before explained, there is still left such head-room over the diaphragm and under the valve, within the core, as to afford ample scope for the direct passage of nitrous oxide along the inlet A M to the patient by the outlet N F.

One more point, and I have done with this apparatus.

In the Bag Regulator, gravity and the partial vacuum within the bag assist the first flow of gas to it. In the Governor, the three-wayed tube being reversed, gravity hinders the first flow of gas to the bell; and in addition to this, the friction of the stop-cock tends to arrest its rise; hence a slight addition to the counterpoise is necessary. But insomuch as when the bell is most depressed and the stop-cock fully open, the rush of gas for a short period rapidly raises the bell, its further progress gradually decreases in velocity, as the revolution of the stop-cock diminishes the passage of the gas; at this time the weight should be mostly in favour of the ascent of the bell.

Now you will see that over the top of the

double sextant there is an hermetically sealed tube. This contains half an ounce of water. When the bell is down, the weight of this water shifted forward is against the ascent, but when the bell is half-filled, the weight is equally distributed. As the pressure of gas diminishes in force beyond this stage, so the water flows over to favour the ascent and the "shut-off" of the gas. Examination of the apparatus on the table will make this action evident.

It must be understood, that in order to guarantee the perfect action of the Governor, the pressure in the pipes leading to it must be maintained in a greater degree than is ever required by the patient.

Before entering upon the analysis of the results obtained by the use of the automatic supply, I venture to draw your attention to the measures taken by coal-gas companies for obtaining perfect uniformity of desired pressure on their mains, believing, as I do, that the method of overcoming their difficulties throws some light upon our somewhat parallel condition. I quote from Ure's "Dictionary of Arts and Manufactures," whose illustration of Wright's coal-gas governor I have reproduced (*see* diagram 3). He says: "Although the gas-holder is, to a certain extent, a regulator of pressure, yet it is difficult, by its action alone, to maintain a pressure so steady and

uniform as that required for the supply of gas consumers. It would be difficult, if not impossible, to alter the pressure upon the mains frequently during a single night, as is now usually done in towns with a large number of street lamps, without the intervention of an apparatus termed a Governor.

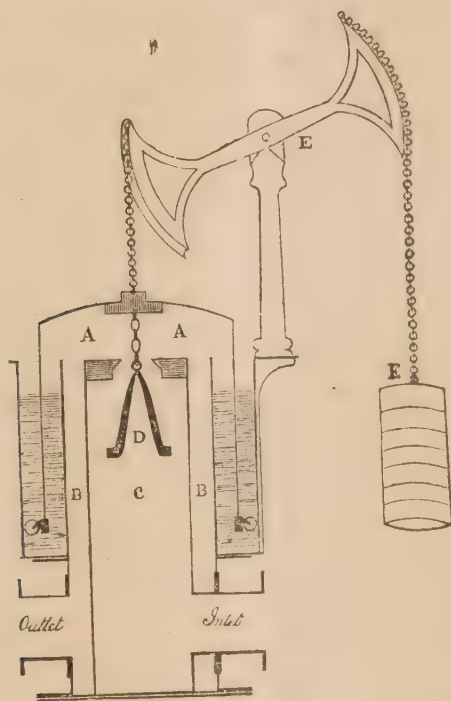


Fig. 3.—WRIGHT'S COAL GAS GOVERNOR.—Sectional View.

Drawn to scale $\frac{1}{50}$ real size.

A The Bell.

B Outlet Pipes.

C Inlet Pipes.

D Parabolic Piston.

E Lever and Weights.

“The governor, which occupies a position between the gas-holder and supply-mains, is a miniature gas-holder (A), the interior of which, however, is nearly filled by the concentric inlet and outlet pipes (B and C). Immediately over the

mouth of the inlet pipe, and depending from the roof of the inner cylinder, is a parabolic piston (D), which hangs within the contracted mouth of the inlet pipe C. The interior cylinder is counterpoised by the lever and weights E E.

“Now, when the pressure of gas in this small holder increases, that is, when the flow of gas through the inlet pipe exceeds that escaping from the outlet, the inner cylinder (that is the bell) rises; but in doing so it carries with it the parabolic piston D, and thus contracts the orifice of the inlet, and consequently diminishes the ingress of gas. In this way, by adjusting the weights attached to the lever of the governor and by always maintaining a pressure in the gas-holder greater than is required in the mains, the gas can be delivered from the governor at any required pressure.”

Many on first sight will be inclined to think it was unwise to construct a new apparatus as governor, when Wright's coal-gas governor is so admirably suited for its purpose, and might have been adopted for regulating the flow of nitrous oxide. But against its adaptation were some insurmountable difficulties, such as the impossibility of preventing the risk of water being sucked into the outlet pipe, and the liability of the parabolic piston becoming jammed in the inlet socket. When used as a coal-gas governor,

weight is always in favour of the flow of gas, so that such jamming of the passage is then not probable.

The action and contrivance of the coal-gas governor is, moreover, to convert pressure into steady and uniform delivery. The purpose of the nitrous-oxide governor is to convert pressure into varying pressure, and to provide a rapid "shut-off."

It may be said that we have no call for a regulator or governor, now that we are provided with compressed and the so-called liquid gas. Notwithstanding the benefits conferred by these preparations, I am inclined to believe that neither with them can be obtained an atmosphere of nitrous oxide, unless some appliance be adopted by which two free sources of supply shall be yielded. I understand, too, that some objections exist against the compressed gas; such as difficulty of delivery and chilling effects.

If to a bottle of compressed or liquid gas the governor be attached by means of such a box-lute having a valve-trap, as is shown in diagram 4, I believe these difficulties would be overcome, and that the inhaler's comfort would be increased thereby; for the escape of nitrous oxide from the bottle would be then continuous during the inhalation, and only at required pressure, the

valve-trap allowing, by its chest-capacity, the storage of sufficient gas to convert speed into volume, and by the valve to prevent the escape of too much.

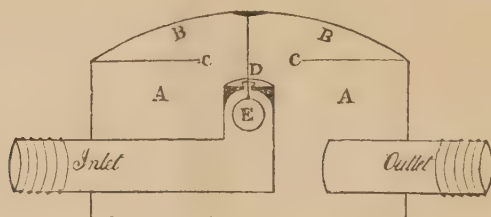


Fig. 4.—ELASTIC VALVE TRAP.

Drawn to scale $\frac{1}{4}$ real size.

Designed for a Lute between compressed Gas Reservoir and Governor.—

- | | |
|---|------------------------------|
| A Valve Chest. | C Fixed Diaphragm. |
| B Elastic Diaphragm. | D Socket for reception of E. |
| E Ball which, rising into D, shuts Inlet. | |

To render the comparative value of automatic supply apparent, I have tabulated, out of 400 registered cases, the particulars appertaining to three consecutive sets of fifty.

The first, being of those who were anæsthetised either with nitrous oxide stored in a large bag, or otherwise directly from the gasometer, with heavy pressure thereon.

The second being of those who were anæsthetised when the bag-regulator was in use.

The third being of those who were anæsthetised when the governor was in use.

The results being as follows :—

Numbers anæsthetised.	Gas used.	Average Dose.	Average Time.	Satisfactory.	Unsatisfactory.
Fifty consecutive patients with nitrous oxide gas stored in a large bag, or administered direct from gasometer with heavy pressure on	Gallons.	Gallons.	Min. Sec.	Cases.	Cases.
182	3.64	1 17	30	20	
Fifty patients with nitrous oxide gas administered with the bag regulator in use	132	2.64	1 24	37	13
Fifty patients with nitrous oxide gas administered with the governor in use	156	3.21	1 47	45	5

By this it will be understood that whilst the use of regulators tends to lengthen the average time to produce anæsthesia, the quantity of gas required is diminished, and the increase in the numbers of satisfactory cases is very great.

In dividing the cases into satisfactory and unsatisfactory, I took as my guide only the direct and subsequent action of the gas; such as, whether the patients enjoyed quiet rest and rapid recovery, or were excited and suffered subsequent headache: beyond this I omitted all other considerations.

It was my intention to have brought forward a tabulated arrangement of cases, which I made, showing the difference of amounts of gas inhaled in varying barometric pressures. My numbers were insufficient to prove what many instances suggested; viz., that with decrease in atmospheric pressure smaller quantities of nitrous oxide are required. I hope to be able to continue the examination of this condition and prosecute the inquiry to a definite result.

Experiments by increasing the temperature of the gas employed, demonstrated that accession of temperature decreases comfort and rest.

Many instances of excitement have been traced to the agency of stimulants imbibed before the patient's arrival, and in order to test this we have experimented by giving varying quantities of stimulant before administering the gas. I may say that invariably such treatment has tended to prolong the period required to produce insensibility and to increase excitement.

Such experiments have been instituted irrespective of the 150 cases tabulated; hence they represent only average cases.

The beneficial results obtained by the use of the automatic supply may be traced to the fact that patients obtain the gas with so little effort, that it is respired without that degree of muscular exertion needed in ordinary methods, and which probably

tends to after-excitement. Be this as it may, it is undoubtedly a fact that patients breathing from an automatic supply have not that tendency to such irregular, forcible, and frequent breathing as when inhaling through other apparatus. The quantity required to produce anæsthesia is not only reduced in a marked degree,—something like one-third,—but the period of insensibility is longer, and patients who have previously taken nitrous oxide by other methods, declare they experience by this increased facility and comfort.

In speaking of the results obtained, I have referred both to quantity used, and the time required to produce anæsthesia. As my method of taking these particulars during inhalation varies from the usual plans pursued, I will briefly describe each.

For the purpose of discovering in each administration the time required to produce insensibility, I attached a stop-watch to the two-wayed tap, so that the movements of opening and closing the tap should automatically start and stop the watch (*see* diagram 5). Upon the dial of the watch is secured an independent index hand, so that before commencing an operation, this hand having been set to correspond with the minute; on the conclusion of operation, the time elapsed is registered by the progress of the minute hand beyond the index, plus the number of seconds

shown, or, if the whole time has been below a minute, the reading is by the seconds dial alone.

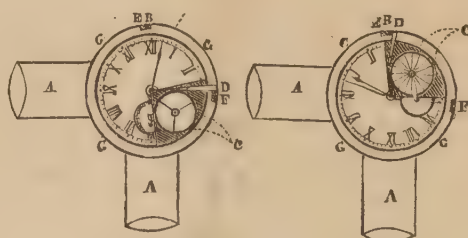


Fig. 5.—TIME INDICATOR.

Drawn to scale $\frac{1}{4}$ the real size.

(Portion of Dial removed, to show Balance-wheel and Stops).

- | | |
|-------------------------------------|---------------------------------|
| A Cloyer's Two-wayed Stop-cock. | D Stop-lever. |
| B Wedge for Starting the Watch. | E Position of air-hole. |
| C Handle of Stop-cock. | F Wedge for Stopping the Watch. |
| G Case in which the Watch revolves. | |

The ordinary apparatus for discovering the amount of gas used during administration requires an effort of sight; and with the attention concentrated upon the patient's condition, and the rapid sequence of anæsthetic signs, this appeared to me very undesirable. To avoid, therefore, the necessity of using sight, I decided that sound should intimate the quantity passing. I therefore adopted a quantity-indicator actuated by an electric current (*see* diagram 6). The arrangement of this indicator is very simple, and is as follows:—To a single-stroke electric bell, in my surgery, I attached wires, one of which is connected with the positive pole of a Leclanché battery, and the other passes directly to the axis of a toothed and pulley wheel placed above my large gasometer, having a weight

dependent upon a cord passing over the pulley, and attached to the bell of the gasometer. A wire from the negative pole of the battery is connected to a light platinum spring, which makes contact with the teeth of the pulley-wheel as it is revolved during the descent of the gasometer, and so completes the circuit; thus causing at each contact one stroke upon the electric bell, to warn the administrator of the quantity passing. I have cut the radii of the toothed wheel at $\frac{1}{4}$ of an inch, these allowing from a 100-gallon gasometer the escape of a half-gallon between each contact.

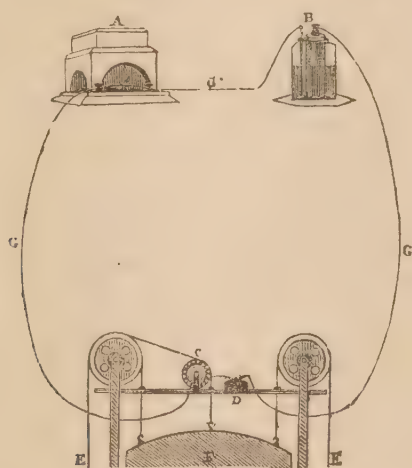


Fig. 6.—DIAGRAM ILLUSTRATING THE ELECTRIC INDICATOR OF QUANTITY.

- | | |
|--------------------------------|--------------------------|
| A Single-stroke Electric Bell. | D Contact Breaker. |
| B Leclanché Battery. | E Cord for Counterpoise. |
| C Contact Maker. | F The Gasometer Bell. |
| G Wires forming Circuit. | |

These instruments afford accurate indications, and beyond being of service to the administrator at the time, have been of value in registering those particulars necessary to complete analysis

of the merits, and the comparison of one system of administration with another.

I have produced this record of my experiments to demonstrate to you that automatic supply, with indication of quantity and time, affords superior facility for the administration of nitrous oxide. By this method the precise quantity of gas needed is yielded to the patient at each inspiration without waste, the time elapsing is registered with instant accuracy, and the amount indicated during inhalation, so that whilst all work automatically they are yet under observation, and the operator's attention is not distracted from the patient.

GENERAL MONTHLY MEETING,

Monday, March 3, 1873.

ISAAC SHEFFIELD, Esq., PRESIDENT, IN THE CHAIR.

The Minutes of the previous Meeting were read and confirmed.

The following gentlemen were elected non-resident Members of the Society :—

Mr. DAVID WATSON, Torquay.

Mr. MORDAUNT STEVENS, M.R.C.S., L.D.S., Paris.

Mr. RICHARD BLAIR, Manchester.

The following donations to the Library were announced :—

"Manual of Metallurgy," by Mr. MAKINS, M.R.C.S., &c.

"Monthly Microscopic Journal," by Mr. PARKER.

The following contributions were presented to the Museum :—

By Mr. LORD, of Blackburn, through Mr. Thomas Rogers :—
Case of union in a central and lateral incisor of the lower jaw, removed from a child of eight or nine years old.

By Mr. HARE, of Limerick, through Mr. Harding :—1. Case of union of second molar and wisdom teeth of the upper jaw, removed from a lady, aged 50 years : severe hæmorrhage followed the operation. 2. An upper molar tooth, having its fangs considerably lengthened and agglutinated, and having the appearance of possessing a persistent pulp. The extremity

of the fang appeared to enter into and form part of the floor of the antrum, in which cavity there was matter. The removal of the tooth permitted a free discharge of pus through its alveolus, and in a short time a perfect cure. 3. An upper molar tooth, with unusually long and divergent fangs.

Mr. HARDING presented a specimen of a bicuspid tooth having absorption of its fang.

Mr. G. HENRY presented a specimen of a bicuspid tooth, in the fang of which absorption had also taken place. The process of absorption appeared to have been checked by the resistance of the pulp, which was protected by a thin tube of dentine. The cause of the absorption was not clear, it was perhaps due to abnormal pressure of the antagonizing lower tooth. A similar case was recorded in Mr. Tomes's Manual.

Mr. HARDING stated that his patient was the subject of secondary syphilis, and had suffered considerable loss of alveolus.

Mr. OAKLEY COLES had recently, in a case where the patient had suffered from secondary syphilitic ulcerations in the upper jaw extracted a molar tooth, in which the anterior buccal and the palatine fangs were considerably absorbed.

Mr. CHARLES STOKES, through Mr. O. Coles, presented to the Museum specimens showing a new method of pivoting teeth, devised by Mr. Thomas, of Madrid.

Mr. F. HENRY would like to make a few observations in respect to an incident which occurred a few days since in his operating-room, and which suggested a probable cause for the unfortunate casualty at Exeter. A lady, desirous of having a lower molar tooth, very much decayed, removed under nitrous oxide, was placed under the influence of that agent. It was administered to her twice, and upon recovering after the second administration she exclaimed that she could not swallow and was choking. From these sensations she was relieved after one or two attempts at swallowing. Upon examining the tooth, it was found that two sides of the crown were missing.

They were searched for, but could not be found. They had doubtless lodged somewhere in the throat, probably under the glottis. Viewing this case in connection with that at Exeter, he thought it most probable that in the latter the missing fragment of the prop lodged under the glottis and finally in the larynx.

The PRESIDENT.—Was the patient quite insensible during the second operation?

Mr. F. HENRY.—Quite.

Mr. SEWILL thought that if the fragments of tooth had lodged in the immediate neighbourhood of the glottis, there would have been symptoms of suffocation; he should rather infer that they had lodged somewhere at the back of the tongue. Whilst on the subject of nitrous oxide, he would ask permission to make an explanation with regard to his remarks during the discussion on nitrous oxide at the December meeting. He then had said that Dr. Richardson had stated that chloroform had been given many thousands of times without a death, and he (Mr. Sewill) brought forward other facts to show that much reliance must not be placed upon statistics alone; and that we should be guided rather by our knowledge of the physiology of the action of the agents in judging of their safety. Mr. Sewill next read at length Dr. Richardson's statistics from a paper published in the *Medical Times*. From these statistics it appeared that chloroform had been given at eight hospitals during five years from 1848, in 17,000 cases, before one death occurred. Other instances of a similar character were recorded by Dr. Richardson. Nevertheless, when all the statistics were examined, it turned out that (in spite of frequent runs of so-called good luck in the experience of individuals and hospitals) the mortality from chloroform was as inevitable as that from accidents and acute diseases; and this mortality was not less than 1 in 3,000 cases. From such facts Mr. Sewill had argued that although our knowledge of the physiology of the action of the gas showed it to be a much less dangerous agent than chloroform, still accidents from it

were possible, and, under some circumstance, probable. The mere fact that the gas has been given successfully a great number of times was likely to lead the ignorant to believe in the "impossibility" of a fatal accident, an error which could not be too emphatically contradicted. Such, Mr. Sewill said, were the arguments he had put forth at the December meeting, and he now supported them by facts. His remarks had been reported so imperfectly in the Transactions of the Society, that it appeared as though he had made some merely vague assertions, and as though he had compared nitrous oxide as regards safety unfavourably with chloroform, a mistake which no one could possibly commit who was conversant with the current knowledge of the subject.

Description of Dr. Morrison's Dental Engine. By

EDWIN SERCOMBE, M.R.C.S., L.D.S., &c.

MR. PRESIDENT,—I must offer some apology for daring to appear before the Society with so simple an affair as this, but I am responsible to my friends for promising to exhibit it.

It was suggested to me by one or two members of the Society, that the time had arrived when this machine should be brought before the Society in a somewhat formal manner, and I was asked to do so from the fact that I had been known to have had it in use for the best part of a year. I, of course, was very pleased to be the channel through which any information connected with it should reach the Society; for, in the first place, I have been long intimately acquainted with the inventor of it; and, in the next place—which, perhaps, will be more interesting to the Society—I have had a good deal of experience with it, extending, as I have already remarked, over a period of nearly a year. You are all aware that in a great many cases when preparing a cavity for stopping a tooth, a drill, variously arranged, has been in use. A rose-top, as it has been familiarly called, mounted upon a crutch handle, rotating freely, and finding some support from the palm of the hand, has been the most favourite instrument; but

its movement is very slow, the economy in time comparatively slight, and the result very imperfect—so much so, that a great deal of the work of preparing a cavity to receive the gold has been done by cutting instruments of various forms.

Dr. Morrison, to whom we are indebted for the valuable invention of the chair bearing his name, has taken some years to bring this engine to its present state of perfection. He was meditating upon an instrument of this kind some years ago to my certain knowledge, but though his brain is most active, he does not submit his inventions to the public until they are in the highest state of perfection. Dr. Morrison had an idea that the rotary movement which we had hitherto given with the finger and thumb might be improved upon by means of an apparatus worked by the foot, and that the rotations so gained would be infinitely more numerous. After an interval of four or five years he produced this, which he first fancifully called his “baby,” but which he is now pleased to designate as his Dental Engine. Having used it for nearly a year, I am in a position to give a somewhat reliable opinion of it from a practical point of view, and I have no hesitation in saying that it is the greatest gift man has given to man in our profession, next to—if, indeed, it be next to—that now indispensable application of Dr. Barnum’s, the Rubber Dam! For its particular object it

certainly leaves little or nothing to be desired. The rotations at full speed are about 2,000 per minute. Some difficulties, of course, arise from that circumstance, as the burrs are soon blunted; to compensate for which more pressure is applied, and consequently more or less heat evolved. This is somewhat objectionable to the patient; but by keeping the burrs in good condition it may, to a great extent, be avoided. Dr. Morrison has supplied us with a variety of burrs, some for excavating and some for cutting down and polishing the plug. Those employed for excavating do their work with marvellous rapidity, and oftentimes render unnecessary the use of an ordinary excavator, except to remove the *débris*, which, however, can often be more advantageously done with an air-syringe.

One very great advantage obtainable with the engine is, that after the cavity is cut out by using a finer burr, a polished finish is given to the edges, rendering it impossible for a carefully inserted gold plug not to fit the margin of the cavity with a precision before scarcely attainable. In addition to the before mentioned, the uses to which this apparatus may be applied are almost innumerable: it may be used for cutting down the superfluous gold in a plug, and afterwards with a corundum point giving the surface of the stopping such a polish that one or two touches of

water of Ayr-stone, and then of a burnisher, will leave a finish which would otherwise take the operator an hour to produce. The engine may be used also for removing stains from teeth, and especially that peculiar, green, festooned line which is sometimes met with, and which is most difficult to obliterate by ordinary means, but by this machine is got rid of in a few seconds. It may be further used for drilling out roots, for pivoting, also for fine-fitting pivots, if necessary ; and even if after inserting the pivot in its place, it is found that the bite has not been perfectly accurate and that the antagonizing tooth strikes; it can be easily relieved by applying the grinding corundum point to the tooth *in situ*, without producing any discomfort whatever to the patient. I have now enumerated a few amongst the very many advantages which this instrument possesses. Another strikes me : there is a particular kind of cavity which often gives great trouble, which can be dealt with by means of this instrument with undoubted satisfaction. This cavity is found at the neck of a tooth, the contiguous gum is irritable, and the slightest slip of the excavator wounds it, and precludes all chance of stopping the tooth for the time by the hæmorrhage which follows. This accident with the engine need never occur. The burr travels along the margin of the cavity with the most perfect certainty, and without the

least fear of wounding the gum. This is one advantage which will at once suggest itself to the mind of every practical dentist.

Dr. Morrison's dental engine has been in use in the States for more than a year. Other instruments of a similar description have been brought out, two or three of which I have seen, but none in my estimation compare with this in its multitudinous advantages and simplicity of construction. A few of the former, as they have come across my mind, I have cursorily mentioned; but, until you use it, you will entirely fail in really comprehending the immense service it is, both as regards economy of time and a thoroughness in fulfilling all that is stated of it. It presents an appearance which by no means conveys an alarming impression to the mind of the patient; it is noiseless when in motion, and from its extreme flexibility the burrs are capable of being applied at every required angle.

Dr. Morrison has also supplied us with a right-angled motion, which in some cases is most useful, as for instance, the posterior part of the second molar. This last motion is produced by an end being attached to the hand-piece, in which there is a double cog action.

A great variety of points have been supplied by Dr. Morrison to meet all varieties of cases, and any man who uses the engine will provide

himself with new forms as their need is felt to exist. I myself have two circular saws made, which I use in place of dividing files, certainly a little extra care is needed from the rapidity with which the work is done.

There is one set of burrs really invaluable, namely, those for tracing out the decay in the crucial enamel fissures of molar teeth, an operation which, until now, has only been performed at the expense of a great deal of labour; and the imperfect performance of this operation has lead to more failures in the crown fillings of molars than perhaps has been induced by any other cause. In these cases I also often use the circular saws already mentioned. I can fully endorse the opinions expressed by many of Dr. Morrison's friends in the United States, that one-third of one's time can be saved by the use of the Engine.

The PRESIDENT—Do you find that in employing this drill there is more pain experienced than in the ordinary way of excavating a tooth?

Mr. SERCOMBE did not; on the contrary, he believed that upon the whole the patients preferred its use to that of the ordinary excavators.

Mr. COLEMAN had two reasons which induced him to ask Mr. Sercombe to bring Dr. Morrison's valuable instrument under the notice of the Society. The first was, that he thought it only due to the inventor of so ingenious an appliance that his

achievements should be recognized by their Society ; and the second was, because he knew Mr. Sercombe had had more experience in its use than any other individual in this country. He had only employed it for about a month, yet could truly say he should now be very sorry to be without it. He considered it saved quite one-third of the time ordinarily employed in excavating a tooth. Many useful additions he was sure would in time be devised in connection with it. Mr. Sercombe, as he had explained that evening, had already done so. An automatic mallet might, he thought, without much difficulty be arranged in connection with it, so that, perhaps, in time we should almost wholly perform the operation of filling teeth by its instrumentality, with a great saving of labour to ourselves, of discomfort to our patients, and of time to both.

Mr. HARDING had been the fortunate possessor of one of these drills for the last six weeks, and could fully endorse what had fallen from Mr. Sercombe with reference to its utility. He would give one instance of its saving of time. A patient came to him who had had a lateral tooth pivoted in America with a wooden peg, which was broken off close to the opening of the fang. With an ordinary drill attached to that engine, he was enabled to cut it out in the space of two minutes ; under ordinary circumstances it would have taken him ten minutes or a quarter of an hour.

Mr. COLES said it was rather a common fault with these instruments, at least so far as they had been used in this country, that the inner and finer spring was liable to breakage. He had already suggested to one or two, and would make the suggestion again there, that that might possibly be prevented by making the spring of hard platinum instead of steel. He fancied it would be equally elastic, rather tougher, and less liable to breakage.

Mr. TURNER had had an opportunity of seeing these engines in use lately in a great many instances by different people in the United States, and without exception they had all borne witness to

the excellence of their construction and also to their utility. They all had one voice in the matter, and said they would not be without the engine for any consideration. They used it for smoothing down roots. When they prepared a root for a pivot, they did not use a file but one of those burrs, and with a little glass tube with an india-rubber ball at the end of it, kept up the supply of moisture to counteract the heat that might be generated. They also used it in cutting down gold stoppings. They also cut in between the teeth very rapidly with fine corundum wheels: they seemed to think *that* one of the greatest advantages of the machine. Dr. Morrison had given him a packet of those wheels to bring to Mr. Sercombe, but the night before he left New York his boxes were broken open, and the wheels went with a few other things. He had seen also a burring-engine driven by electricity. The whole machine was held in the hand, and was about eight inches long by three inches in each other direction. It was connected with the battery by a wire. The great objection to it was that the speed was not very controllable: it was too great, and liable to put the thing out of order. That, however, might be overcome, and then they would have a burring-engine to hold in the hand, without any of the objectionable and spider-like appearance of this one, and without having to unsteady the body by standing on one foot and working the lathe with the other. He had also seen an electric mallet worked by the same method.

Mr. SEWILL.—Did those electric machines contain their own battery, or were they connected with batteries?

Mr. TURNER.—The burring-engine was connected with a battery, but not the mallet.

Mr. SERCOMBE.—The advantage of the circular files over the corundum wheels was this. It was rather a nuisance to have to remount a wheel once or twice during an operation, which you might have to do with the corundum wheels if sufficiently thin to be used for dividing teeth; but the circular saw, though blunted by cutting through enamel, would retain sufficient

sharpness for the performance of at least one operation, and could without difficulty be re-sharpened when required. With reference to the supply of water, which Mr. Turner also mentioned, he had used an ordinary india-rubber syringe without the least difficulty. The palm of the hand that was employed to keep the cheek from the tooth would carry the ball of the syringe, and eject the water as required, and the wheel was kept thoroughly wet and cold. With respect to Mr. Coleman's suggestion of applying an automatic mallet, I have reason to believe, that not only has Dr. Morrison already thought of adapting a mallet to the machine, but other contrivances, which I am not at present in a position to enumerate. With reference to Mr. Coles's suggestion as to improvement in the spiral springs, I may mention that during the whole time I have used the engine I have only broken one, and that was upon the first occasion of my using it. In a recent communication from Dr. Morrison I learn that upwards of a thousand engines have been sold in the States, which is a sufficient testimony to their value. I have entered one at the International Exhibition this year, on his behalf, as an instrument which ought to be shown there to represent the progressive nature of our department. I am certain English dentists will not be behind their American brethren in availing themselves of these helps to good workmanship.

The PRESIDENT.—Have you used it at all in excising a tooth?

Mr. SERCOMBE had used it in cutting round the tooth, and then nipping off with excising forceps, but he had never sawn quite through the crown of the tooth. The present seemed to him an opportune moment for making a few remarks with reference to the Rubber Dam, to which he casually referred when speaking about Dr. Morrison's engine. It was superfluous to inform the members of this Society that it was to Dr. Barnum, an American *confrère*, they were indebted for this most valuable invention; but he might remind them that the obligation they were under to Dr. Barnum

for his ingenuity in adapting the india-rubber to their purposes was more than doubled by the fact that he had freely given the invention to the profession at large, which was a most unusual course for an American practitioner, when he might have availed himself of the patent laws of that country, and secured to himself large pecuniary advantages. When they found, as in America, where it was not considered a breach of etiquette to patent inventions, a man who would forego all personal advantage, and generously give the results of his experience and observation for the benefit of his brethren, he felt that some recognition should be made by them as a token of their thorough appreciation of what he had done. At any rate, such was his opinion and that of several other members of the profession in this country, and he would suggest that some step be taken, by means of which they could testify to Dr. Barnum how much they valued both his invention and also the free-handed way in which he had bestowed it upon them. This was, he knew, an age of testimonials, and he shrank from them on account of their very commonness; but he believed this to be an exceptional case, and one in which they might pay a just and graceful compliment to the generous inventor of a most ingenious contrivance.

Mr. F. HENRY had an interesting case. It was a model of a very deformed superior maxilla from a young lady, aged 23. He suggested that the teeth should be regulated in some measures; but unfortunately the patient was very indifferent, and would not permit him to do all he would like, so that he had simply extracted the lateral on the left side, with the idea of placing the central incisor in its normal position. This deformity was a great disfigurement to the patient. He thought, notwithstanding her age, if the lady were disposed to undergo the pain and trouble of having the dental arch properly regulated, he should attempt to do so by distending the palate.

Mr. COLEMAN then read a Report of certain experiments he had made upon the new preparation for filling teeth, sold as "Fletcher's White Enamel."

[These experiments were undertaken by Mr. Coleman on behalf of the Committee appointed by the Society, Jan. 14th, 1873 ; but the views of some of its members not coinciding with those of Mr. Coleman, he was requested to offer it as his report only.]

In proceeding to undertake the duty your Committee were appointed to carry out, it appeared to the writer very desirable that as the compound, the merits of which they had to investigate, was chiefly, if not almost entirely, an oxy-chloride of zinc, they should follow as closely as possible the methods pursued by a Committee some ten years ago appointed to investigate similar compounds. He thought also that they might so far presume upon the authority deputed to them as to include in their investigations another similar compound which has been much used for filling teeth : viz., that sold as Guillois'.

By adding the results of experiments made by the former Committee to those he has carried out upon the compounds named, he trusts it will be considered that he has made the present report of more practical value than if it had merely given those pertaining to "Fletcher's White Enamel."

He first ascertained the specific gravity of Guillois' and Fletcher's compounds, which, with those given in the former report, are as follows :—

	Rostang.....	4·04
	Roberts.....	3·71
	Barber	3·41
	Kilnitz	3·74
Average of } two samples }	Guillois	2·948
“ “	Fletcher	3·469

In regard to the above, it may be remarked that Mr. Fletcher places much importance upon his compound possessing a high specific gravity. On comparing the above, such might not appear to be the case; but it must be remembered that that gentleman aims at producing an almost perfectly pure oxy-chloride of zinc, whilst the other named makers certainly include more or less of other ingredients, which would greatly alter the specific gravities of their preparations.

To the periods for setting, as given in the former report, the writer adds those of Guillois' and Fletcher's compounds. According to his experience, those of the latter seem much more uniform in their results than do those of the former, which varied from eight minutes to thirty-five; also the effect of keeping, though prolonging the time of setting, does not appear to do so to the same extent as in the case of Guillois'. In the presence of fluids, Fletcher's certainly sets

much more rapidly and more firmly than Guillois', or any other compound of like nature that has come under his notice.

PERIODS FOR SETTING.

Roberts	6 minutes.
Barber	7 „
Kilnitz	10 „
Rostang	27 „
Guillois (about)	21 „
Fletcher (average)	7 „

The apparatus employed by the former Committee for ascertaining the strength, or cohesive force, of the preparations being imperfect, he is unable to give corresponding information, together with the force with which they adhere to ivory or other smooth surfaces.

The following are the results of the exposure of oxy-chloride of zinc preparations to certain agents :

AGENT.	Barber.	Roberts.	Rostang.	Kilnitz.	Guillois.	Fletcher.
	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.
Sulphuric acid diluted : viz., one part of acid to twelve of water	3.75	2.68	3.04	1.96	4.851	4.458
After immersion for fifteen minutes	1.10	1.89	2.28	1.24	3.150	3.497
Actual loss	2.65	0.79	0.76	0.72	1.701	0.961
Calculated loss	0.70	0.29	0.25	0.37	0.35	0.21
Nitric acid diluted : viz., one part of acid to twelve of water	2.88	2.09	3.54	1.80	4.650	5.213
After immersion for thirty minutes	1.30	1.22	2.72	0.82	3.600	4.150
Actual loss	1.58	0.87	0.82	0.98	1.050	1.093
Calculated loss	0.55	0.41	0.23	0.54	0.22	0.20

AGENT.	Barber.	Roberts.	Rostang.	Kilnitz.	Guillois.	Fletcher.
	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.
Hydrochloric acid diluted : viz., one part of acid to twelve of water	2.60	2.09	2.90	1.90	4.372	3.888
After immersion for three hours twenty-five minutes	0.98	1.13	1.91	0.52	2.487	2.778
Actual loss	1.62	0.96	0.99	1.38	1.885	1.110
Calculated loss	0.62	0.46	0.34	0.72	0.43	0.28
Acetic acid diluted : viz., one part of acid to twelve of water	3.54	2.07	3.00	2.23	4.530	3.472
After immersion for three hours forty-five minutes ..	2.88	1.64	2.32	1.27	3.972	3.198
Actual loss	0.66	0.43	0.68	0.96	0.558	0.274
Calculated loss	0.18	0.20	0.22	0.43	0.12	0.07
Lactic acid diluted : viz., one part of acid to twelve of water	2.73	1.65	4.69	3.22	4.845	4.622
After immersion for one hour thirty minutes	2.46	1.55	4.17	2.89	4.663	4.560
Actual loss	0.27	0.10	0.52	0.33	0.182	0.062
Calculated loss ..	0.10	0.07	0.11	0.10	0.037	0.013
Ammonia diluted : viz., one part to twelve of water...	4.25	2.45	3.00	2.26	5.685	5.550
After immersion for twenty- nine hours	4.05	2.30	2.88	2.10	4.795	4.595
Actual loss	0.20	0.15	0.12	0.16	0.890	0.955
Calculated loss	0.04	0.06	0.04	0.07	0.156	0.172
Saliva obtained before taking food ; reaction alkaline	2.29	1.36	3.74	1.84	5.619	5.580
After immersion for four days	2.14	1.33	3.70	1.78	5.606	5.580
Actual loss	0.15	0.03	0.04	0.06	0.013	0.000
Calculated loss	0.06	0.02	0.01	0.03	0.002	0.000
Saliva obtained after taking food ; reaction strongly alkaline	1.74	1.90	3.60	1.52	4.400	5.714
After immersion for four days	1.58	1.85	3.50	1.40	4.380	5.714
Actual loss	0.16	0.05	0.10	0.12	0.020	0.000
Calculated loss	0.09	0.02	0.02	0.03	0.004	0.000
Distilled water					2.489	2.781
After immersion for 4 days					2.384	2.735
Actual loss					0.105	0.046
Calculated loss					0.042	0.016

In the saliva experiments it will be seen that the loss sustained by Fletcher's compound was absolutely *nil*, whilst in the case of Guillois' it was very small. He, however, cannot feel sure that his experiments were carried out in precisely the same manner as were those of the Committee in 1863. When compared with the effects of distilled water, saliva would really seem to possess a protective influence in its constituents other than the water it contains.

As a result of these experiments, it would appear, theoretically, that whilst the compound introduced by Mr. Fletcher is decidedly superior in its powers of resistance (except perhaps in the case of the ammonia experiment) to the other compounds experimented upon, it still shows that it is readily soluble in the stronger acids and ammonia (much stronger, of course, than would ever be taken into the mouth, unless by accident), and that it is also soluble in distilled water, which is not the case, he apprehends, with the tissues of which the teeth are composed—at least, when retained in the mouth and possessing vitality.

The only practical experiment which he has been able to carry out is the following:—A mineral tooth attached to a gold plate, and secured by a pin passing through its centre, worn by himself, had a cavity ground into it as deep as could be accomplished by a small

corundum wheel; the cavity included a small portion of the masticating surface of the tooth, and did not extend to the gold plate by the distance of about one-twentieth of an inch. The cavity thus constructed was filled, after careful drying, with the oxy-chloride, and allowed to dry for thirty-four hours, the whole being done out of the mouth. Great care was taken to make the filling quite level with the masticating surface of the tooth, so that it should in no way be exposed to undue friction in mastication. When attached to the plate by means of mastic and silk, its position was as follows:—The tooth represented a second molar of the left side of the upper jaw, but was of a bicuspid form; the portion filled approximated to, but did not touch, in its lower (*i.e.* crown) half, the second molar tooth, and in its upper half a gold clasp. The tooth was worn, as usual, with the plate, in the day only, for thirty days, and then examined. The following are the results of this experiment:—

Weight of tooth having cavity ground into it	10·770
Do. do. with Fletcher's filling	11·946
Do. do. do. after 30 days.....	11·868
This gives weight of filling	1·176
Actual loss in do.	0·078
Calculated loss	0·066

Supposing that the loss continued at the same ratio as long as any of the filling remained, the

whole would be dissolved away in rather less than sixteen months.*

Mr. Coleman feels that too much dependence should not be placed upon a solitary experiment, conducted under conditions not precisely similar to those under which the compound would be generally employed; but still, in conjunction with the theoretical ones, he considers it fully justifies him in warning the members not to place, for the present, unbounded confidence in the material as one which may be universally employed where gold and other preparations are now used.

Having uttered this warning for the benefit of the members of the Odontological Society, he is very pleased to testify to the great willingness shown by Mr. Fletcher to afford him all the information in his power in respect to the compound he has introduced. He has been made aware of the very great and unlooked-for difficulties that that gentleman has met with in preparing, upon a commercial scale, his new application, all of which he expresses confidence that he will soon overcome, and be able to supply the profession with an article in every respect fulfilling what he has promised for it.

* In regard to this experiment, it ought to be stated that in the case of the wearer of this plate, oxy-chloride of zinc fillings do not stand at all well in his mouth.

He trusts that within a few months' time the Committee appointed by the Society may be able to communicate the results of a number of practical experiments which have been performed in the mouths of patients under observation, and which will give much more reliable data than that furnished in his present report.

Mr. SERCOMBE proposed that the discussion upon Mr. Coleman's Report be deferred till the next meeting. He possessed the record of 56 cases, in which he had employed Mr. Fletcher's compound, so that he had a large mass of facts to bring before the Society at a subsequent date. His own opinion was very favourable towards the material, but when employed in a subordinate form.

Mr. C. H. WHITE seconded the proposition. It was too late to discuss so important a subject that evening. He regretted that the papers read usually came so late in the evening, for it prevented their being properly discussed, however interesting they might be.

The PRESIDENT put the motion, which was agreed to. He then conveyed the thanks of the Society to Mr. Sercombe and Mr. Coleman for their communications, and to the respective donors for their contributions to the Library and Museum.

GENERAL MONTHLY MEETING,

Monday, April 7, 1873.

ISAAC SHEFFIELD, Esq., PRESIDENT, IN THE CHAIR.

THE Minutes of the previous Meeting were read and confirmed.

Mr. WARWICK HELE, L.D.S., of Carlisle, was elected a non-resident member of the Society.

The following donations to the Museum were announced :—

From Mr. SEWELL, two vertical sections of the roots of a lower molar tooth, mounted for microscopical examination, and presenting a blood-coloured stain in the dentine and cementum (visible with an inch objective).

From Mr. HARDING, model exhibiting a very abnormal bite.

From Mr. HENRY, model of a case of rare form of irregularity.

Donation to the Library :—

The first and second volumes of the *Journal of Anatomy and Physiology*, from Mr. THOMAS A. ROGERS.

The LIBRARIAN having called attention to the fact that the only back numbers of the *Journal of Anatomy and Physiology* were those just presented, said it might, perhaps, happen that some member of the Society possessed back numbers, which,

if not valued by him, would be gratefully accepted for the Library. He might also announce that the Council had been strongly recommended by their publisher to raise the price of the early numbers of their *Transactions*, which were getting scarce : he would, therefore, suggest to members, who did not possess them, the advisability of their doing so before the Council acted upon the advice offered.

Mr. HENRY exhibited a model taken from the mouth of a child, aged twelve years, showing union of the canine and bicuspid. He would like, also, to report the successful treatment of a case of polypus of the tooth-pulp. He believed he was correct in stating that authorities generally recommended the extraction of a tooth so affected. The patient in the present case demurred to the parting with his tooth, so he (Mr. Henry) attempted to save it for him. With a sharp gum-lancet he first excised the growth, and, when the bleeding had ceased, freely applied strong carbolic acid, which thoroughly blanched the surface of what remained of the pulp ; he then covered its surface with a layer of bibulous paper saturated with creosote, and over this filled with Guillois's cement. He had since seen the case, and the result had been in every sense a success.

Mr. G. R. KEELING then read the following communication :—

Charles Holmes, aged 20, footman, but had been discharged from two situations, because he suffered from a diseased cheek.

Having requested him to give me the history of his case, he stated that in June, 1870, his face on the right side became very painful, and swelled to a great size. The medical man in attendance upon him lanced the cheek, and ever since that time there had been a constant discharge of pus from the place. As he got no better, but grew worse, he became an out-patient of one of the large hospitals in London, and was there seen by several medical men, who said he was suffering from scrofula, and they treated him accordingly for several months.

He then removed to Bletchingley, and while there obtained the advice of a Brighton physician, who likewise pronounced the case to be one of scrofula, and strongly advised him to go to New Zealand, as the voyage would do him good, and the climate of that colony would suit his constitution. Months passed away, and as there was no improvement in the condition of his face, he consulted another physician with an extensive practice in a country town, who told him once more that it was a case of scrofula, and prescribed accordingly ; but the treatment, like all the rest he had been under for nearly two years and a half, was attended with no perceptible advantage whatever, and he (Charles Holmes) became very dejected.

It was then suggested by a friend that he should consult me. He came, and having made a careful examination of the parts involved, I discovered that the crown of the first molar tooth in the upper jaw on the right side had decayed away ; only the fangs remained, and they were in a state of necrosis. I recommended their instant removal, which was done. I then passed a silver probe through the alveolar crypt of the palatine fang, into the antrum, and to the wound on the cheek.

All pain ceased from that day. In less than a fortnight the wound healed, and the face has been improving in appearance ever since.

[The patient was then introduced by Mr. KEELING, and was examined by the members present.]

The PRESIDENT said the case seemed a very satisfactory one. One of a similar nature had come under his own observation, which had been under treatment previously for two years. The mischief he at once traced to an undeveloped lower wisdom-tooth, which he removed, and within a fortnight the patient was quite well.

Mr. KEELING would also like to report a case of severe symptoms, viz., rigidity of the lower jaw, existing for three weeks, requiring very considerable force to overcome it to a

very small extent. Having separated the jaws apart to a small distance, he was enabled to discover the source of the trouble. The root of a wisdom-tooth of the lower jaw upon the right side had set up suppuration, which had evacuated the pus in three openings, near to the condyle. With a very suitable instrument, which fortunately he possessed, he succeeded in dislodging the root. The patient made an excellent recovery. Mr. Keeling would also like to relate the case referring to a remarkable preparation of malformed tooth, which he would present to the Society. It was a bicuspid of the left side, and bore no small resemblance to a Wellington boot, the portion representing the toe being directed towards the condyle of the jaw. In order to extract it without breaking it, he deliberately fractured the alveolus, but afterwards pressed the fractured portions into position, and applied solution of carbolic acid in glycerine. In a fortnight's time the wound had perfectly healed.

Discussion upon MR. COLEMAN'S Report upon "Fletcher's White Enamel."

The PRESIDENT having called upon Mr. Coleman to make any further observations he might think fit upon the Report he read at the last meeting of the Society upon Fletcher's White Enamel, that gentleman said he was glad of the opportunity of explaining to the members how it came about that, whilst they were invited to listen to a Report, purporting to come from a Committee appointed by themselves, that Report afterwards appeared as emanating from a single member only of the Committee. His explanation was that he had offered to undertake some (theoretical he would call them) experiments for the Committee. Owing, however, to a mistake upon the part of the printer, copies of that Report were not furnished to them before it was read at their last meeting, and, therefore, he was requested to make the Report his own, which he willingly did. He was particularly desirous of offering this explanation, as he had rather pressed the reading of that Report at the last meeting; and for this reason, viz., that he was most anxious

that the members of the Society should not too hastily commence the general employment of a preparation which had manifested certain imperfections when subjected to chemical tests which had previously exhibited the worthlessness for permanent fillings of certain compounds of the same class. He well remembered an oxychloride of zinc compound being highly extolled at one of their meetings more than ten years ago by a practitioner of considerable reputation, and he knew that several members were induced by the statements put forward to employ it in place of gold, to their chagrin and loss, as it turned out to be one of the most imperfect preparations of the kind. It was from what was stated upon the occasion referred to that a similar Committee to that now existing was appointed to investigate the merits of that and similar compounds, and he would ask the members to refer to that Report and see if the conclusions suggested by the theoretical experiments in the first notice were not fully borne out by the results of practical observations recorded in the second notice.

Referring to the Report he had read at the last meeting, the compound introduced by Mr. Fletcher certainly appeared, from all the experiments recorded, except the ammonia one, to be decidedly superior to the other preparations examined. With regard to the ammonia experiment, he was inclined to believe there might be some error, and that the strength of the fluid employed was not in the case of Guillois and Fletcher's the same as in the former experiments. He held in his hand a letter from Mr. Fletcher, who, he was glad to say, admitted the fairness of his Report, and stated that it had opened his eyes to certain defects which he was sure could be rectified; and here he would bear testimony to the zeal and frankness with which Mr. Fletcher was carrying on this work: he appeared to be striving far more to supply a want than to be seeking his own advantage. Mr. Fletcher had pointed out to him that his experiments would have been more trustworthy if carried out upon larger masses of the preparations. This he fully admitted, but his reason for not doing so was the desire

to make them uniform with those in the Report of 1863 ; besides, the quantities he had used would more nearly represent those employed in practice. With regard to the experiments themselves, there was one element of error which it was almost impossible to eliminate, viz., the uncertainty of obtaining the preparations in the same state of dryness before and after they had been subjected to the agents. For even when carefully dried in the water-bath, some might retain more water than others, and thus give an apparent unfair advantage to the former over the latter. Every care had, however, been taken to obtain correct results ; the experiments, though not numerous, had really taken a very large amount of time to carry out, and might, upon the whole, be considered trustworthy. If the Report should prove of value in cautioning members to employ the oxychloride of zinc compounds very cautiously until more practical, and therefore more reliable, information upon their durability had been placed before them, he (Mr. Coleman) sincerely trusted it might not have the effect of discouraging Mr. Fletcher, or any other gentleman, from pursuing his researches in regard to these or any other preparations which could be applied in the same way ; for whatever might be said extolling the skill and talent necessary in the production of a good gold filling, to our patients and ourselves it would be the greatest boon if some preparation could be discovered applicable, like oxychloride of zinc to shallow and fragile cavities, closely resembling the teeth in colour, and as little acted on by agents or suffering by attrition as was a solid gold filling.

Mr. HENRY would ask Mr. Coleman whether it were probable that the loss referred to in the practical experiment recorded in his very valuable Report, arose from friction in mastication. He believed that a portion of the filling formed part of the masticating surface of the tooth into which it was inserted. Having tested the comparative hardness of Fletcher's and Guillois's cements out of the mouth, he was led to believe that the latter was the harder of the two, but Fletcher's, when inserted

into cavities not exposed to great friction, and carefully burnished after insertion, he had found to stand remarkably well.

Mr. COLEMAN in reply, could state that the loss in the experiment referred to by Mr. Henry, appeared to be almost entirely from solution,—chemical action,—and not from attrition. There appeared to be no loss in the substance of the filling upon that portion of it exposed to mastication ; at the upper portion, or gum proximity, the loss was apparent to the naked eye.

Mr. SERCOMBE, as a member of the Committee appointed to investigate the merits of Fletcher's preparation, would make a remark or two anticipating the Report which he hoped would before long be presented to the members. He had limited his use of the material to those cases in which he should otherwise have employed Guillois's, or some similar compound. He had not dared to employ it in any case where gold could have been used, as he was not yet satisfied that it was an agent that could be substituted for that metal. Since the Committee had been formed he had employed it in about sixty cases, and had had opportunities for seeing a large proportion of them since the fillings were inserted : up to the present moment he had been exceedingly well satisfied with the general results. In one exceptional case the filling had from some cause never become hard at all ; but in this case there was no other similar compound in the mouth by which any comparison could be furnished, the other stoppings being all of gold. All who had employed the oxychlorides would no doubt agree with him when stating that much of their success would depend upon the method of manipulation : if carelessly inserted, and without proper precaution, as by means of the rubber-dam, to prevent any moisture having access to them until they were perfectly set, they would, as his experience had shown him, give unsatisfactory results ; but where every care had been taken the results had, up to the present time, under his hands, been very satisfactory. Still, he was not yet able to bring himself to believe that it would stand friction as would a solid gold plug, or that in

possessing it we had reached that happy condition which Mr. Coleman so devoutly desired, and which he supposed none amongst them desired less devoutly both for their patients and for themselves.

The PRESIDENT said the Society was, he felt, very much indebted to Mr. Coleman for the pains and labour he had bestowed upon the subject under consideration. There was no branch of their profession more important than that of preserving the teeth, and any extension of their powers in this direction was most valuable.

Mr. COLEMAN, for the sake of furthering discussion, would draw attention to one point which he was certainly struck with in using this compound. It appeared to him to be a much more manageable one than any that had yet been introduced. It set very rapidly, and if, as Mr. Sercombe had observed, care was taken to prevent moisture getting to it for only three or four minutes, it became very hard. It appeared also to be much more uniform in its character. That especially sold under the name of "Guillois's" was a very varying compound, sometimes setting very rapidly and at other times not setting for a very long time.

The PRESIDENT asked if Mr. Coleman had observed any tendency to shrinking in the oxychloride fillings.

Mr. COLEMAN thought in that respect almost all the oxychlorides of zinc possessed an advantage. They did not appear to contract or expand in setting. They certainly did suffer from wear, but at the same time they did not suffer nearly so much from that cause as they did from chemical solution. Oxychloride fillings upon a masticating surface would generally last at least some three or four years, but in interstitial cavities they frequently were found imperfect in as many months. As they were without a paper that evening, he would venture to diverge a little from the subject before them, and state that he had found the oxychloride fillings most serviceable in the following

cases:—Patients often came to London practitioners from a considerable distance, and not unfrequently the teeth they required to have filled were found to be discharging through their pulp-cavities. In such cases he had adopted the following treatment, after dousing—he would term it—the cavity well with carbolic acid, and, if necessary, protecting the pulp with a small paper or thin cardboard cap, filled over with the oxychloride. In but few of them was there any pain experienced afterwards. In many, after the lapse of from one month to three months, upon removing the fillings, no trace of discharge could be discovered, and they might then be filled with gold; but in many other cases upon removing the oxychloride, it would be found to be saturated with the discharge and highly offensive. The reason in those cases why no pain was experienced would be explained by the fact that the oxychloride was porous, and thus absorbed and permitted the escape of the discharge,—an opinion which he had seen expressed, he believed, in the Dental Cosmos, and which he adopted as correct. In dealing with very sensitive teeth the oxychlorides of zinc were most serviceable, especially in the case of young persons, to whom the process of excavation was often positively unbearable; temporary fillings with these preparations would generally so obtund the sensitiveness of the dentine as to enable the practitioner to ensure a cavity capable of retaining gold with security. The application of Fletcher's cement was certainly not attended with so much pain as in the case of most other similar compounds, but he was not prepared to say that its effects were in this respect as apparent as in them; he was inclined from observation to believe not. In reply to a question from the chair, he could not say that the colour of Mr. Fletcher's preparation closely assimilated to that of the teeth; coloured material was supplied with it, to mix according to circumstances: still, in a front tooth it certainly appeared less conspicuous than gold.

Mr. HENRY must demur to the opinion that a suppurating pulp, when treated as Mr. Coleman described, went on

suppurating, and the matter was absorbed through the porosity of the filling. He rather thought that the dousing (as he termed it) with carbolic acid, produced an insoluble layer, and the protecting layer placed between the pulp and the filling prevented any further suppuration. The success he had met with in the treatment of exposed nerves by putting on a layer of bibulous paper between the actually exposed surface and the white enamel had been so remarkable that he could not think there was in any case further suppuration. The secret was not in capping a nerve, but in putting a tissue between the pulp and the stopping. He thought that any vacuum left between the nerve and the cap would be fatal to success, and that was why he preferred flexible tissue placed between the pulp and the filling.

Mr. VEASEY would feel much obliged to Mr. Coleman if he would satisfy the meeting on this point. Did he mean them to understand that the cases he mentioned were those of suppurating pulps, the suppuration of which was instantaneously arrested after treatment by this plastic stopping?

Mr. COLEMAN replied that the cases to which he alluded were rather those in which one might believe that a portion of decomposing tissue was present in the pulp-cavity, or rather in the nerve-cavities. He was not so much alluding to an exposed and discharging pulp, as to one of those cases in which the tooth was free from sensation in excavating it, and where even without particular caution, you did not expose any sensitive portion of it, but there was a discharge existing in the pulp-cavity. Without even taking the precaution of introducing the carbolic acid, if you filled such a tooth at once with an oxychloride of zinc, he felt pretty certain that in eight out of ten cases the patient would have no further trouble as long as the filling remained perfect.

Mr. TURNER would ask Mr. Coleman to tell them the results of those cases to which he had applied the oxychlorides over suppurating pulps.

Mr. COLEMAN said that the results in these cases had mostly been satisfactory, though less so than in the cases to which he had just alluded. Upon removing the stoppings after some time, the pulp was frequently found to be in the same condition, or nearly so, as at first, and the fillings had to be re-applied.

Mr. FAIRBANK thought that in those cases where the pulp was suppurating and the cavity was filled, if there were any further trouble it was not so much from the generation of pus as from the generation of gas, and he had no doubt but that the chloride of zinc in the oxychloride filling would prevent any of that decomposition. He also thought they must also remember that the pulp was a very small body, and that the amount of pus that came from the pulp itself was really very small. When we got a vast amount of matter, it was not from the pulp, but from the periodontal membrane, and the pus came up through the hole in the apex of the root. He considered it a bad plan in any case to fill a tooth where the nerve was suppurating. The patient might not come back ; he might bear with it ; but the tooth was never a sound tooth, and, if not always, was occasionally, loose. He thought the only plan in these cases was to remove the nerve and fill the nerve-cavity. He would also say, in connection with the oxychloride fillings, that they were very useful in filling the canals of roots after the nerve had been removed. He generally filled the canals in the roots with cotton wool, introduced upon a fine watchmaker's drill. He found that Fletcher's cement did not mix with the cotton wool. The cotton wool did not absorb Fletcher's cement so well as Guillois's ; and although it was less irritating than Guillois's, it was less fitted for filling the canals of teeth of which the nerves had been destroyed. Fletcher's cement, too, did not seem so well fitted for building up lost portions of a tooth.

The PRESIDENT would like to know whether the compounds had been found to stand well in those cases where caries

had supervened upon recession of the gum. Gold answered very nicely in such cases, but it was often very conspicuous.

Mr. COLEMAN trusted that, in replying to these questions, he would not be regarded as the champion of oxychloride of zinc for filling teeth. In speaking of the uses of these agents he did not for one moment put them into competition with gold or amalgams in point of durability. In answering the question put by the President he should say they did not answer well in the positions he had named ; as a rule it might be stated, he believed, that the further they were from the gums the longer they would be found to last. Again, in different mouths they stood very differently ; in some he had seen them continue in good condition for from five to, he believed, eight years ; the latter had been introduced in Germany, they were of a yellowish colour, and not very hard in consistence, but by whom prepared he could not find out ; in other mouths they proved worthless in a few weeks. In making these remarks he did not include Mr. Fletcher's stopping, his experience with it at present being of too short duration.

The PRESIDENT said he had found in practice that the oxychlorides of zinc appeared to suffer most in those portions of cavities which approximated upon the gum ; this was a great drawback to their usefulness. It would be a great thing if Fletcher's preparation was found after trial free from this defect.

Mr. HENRY had filled several teeth, with the greatest satisfaction, with gold and amalgam after having inserted a layer of the oxychloride of zinc. In such cases, the oxychloride not being exposed, no injurious change could take place in it.

Mr. SEWELL said there was a practical remark of Mr. Fairbank's worth consideration. With Fletcher's filling the material required more thorough incorporation than the other materials. On first adding the liquid, it assumed a granular

appearance, but if you continued working, the granules disappeared and the mass assumed a homogeneous character. If the whole was not saturated, the result was not so good. If the trituration was not complete, the difficulty in working it which Mr. Fairbank spoke of was often the result. He had had considerable correspondence with Mr. Fletcher on this subject, and would like to take this opportunity of endorsing what Mr. Coleman had said in regard to the abilities of Mr. Fletcher, and the honest way in which he was doing this work. He was evidently not working in the dark, and mixing up materials the nature of which he did not know. He understood the chemistry of the subject thoroughly, and all his experiments were based upon reason. He confessed he thought if he had put forward his filling a little more modestly at first it would have been better ; but, that he was doing a good work there could be no doubt.

Mr. SERCOMBE said he long since discovered the importance of the point Mr. Sewell had alluded to, and he had for some time past invariably put Fletcher's powder into an agate mortar and ground it up with the liquid. He found the enamel became very much whiter and worked more satisfactorily. Merely mixing with the spatula did not satisfy him. They just now drifted into the subject of exposed pulps. It was a very large subject in itself, and could scarcely be treated properly in a desultory conversation ; but he could not bring himself to believe, without going fully into the subject, that it was a safe and wise course to seal up hermetically a suppurating pulp. He could not imagine that a stopping which was so porous as to allow pus to travel through it could be accepted as a stopping at all. He should be very slow indeed to cover over a pulp in that condition. That the mere brushing over of the surface with carbolic acid should restore to a perfect state of health the whole body of the pulp, was more than he could bring himself to believe. It had taken probably a considerable time to get into that unhealthy condition, and in all probability it would take a considerable time to recover its healthy

state, if ever it did. That the pus came from any other source when it passed through the pulp-cavity than the pulp itself, he also found a difficulty in believing. The subject was of such deep practical interest that it would be very well worthy of further and more careful consideration. The pulp, when exposed, appeared under such a variety of conditions, that it could not be treated in all cases alike. Sometimes it was suddenly exposed by an instrument. The treatment under those circumstances must be very different from the treatment of a pulp that was in a chronic state of suppuration. Then he thought it was almost as dangerous to cover it over with a soft tissue, as to put a cap on. If you left a space between the under-surface of the cap and the pulp itself, you would in that case get granules sprouting up of a highly sensitive nature. On the other hand, if the tissue composing the cap was of a very delicate nature, Fletcher's stopping would depress it, or cause it to impinge upon the sensitive organ. These were merely suggestions which he ventured to throw out in reply to some of the remarks that had been made ; otherwise those remarks might be regarded as accepted by all the members of the Society. He did not consider what he had said had been a full reply to the remarks made, but he had merely expressed a few passing thoughts.

Mr. FAIRBANK said in Paris he knew they embalmed with chloride of zinc, and he thought it most probable that in the cases mentioned by Mr. Coleman, where the discharge was arrested, it was due to the antiseptic action of the chloride of zinc.

Mr. COLEMAN, in reply, said he fully agreed with Mr. Fairbank in attributing to the antiseptic qualities of the zinc chloride the result he had named. It often appeared to him as if the discharge from a tooth decomposed the oxychloride of zinc, and set free some of its zinc chloride to act upon the pulp, or any remaining portions of it. With regard to what had fallen from Mr. Sercombe, he could only say that his remarks

were founded on the results of long practical experience. Reference had frequently been made during the evening's discussion to suppurating pulps, and without going into the question at any length, although it was a very interesting one, he would only remark that suppuration of the dental pulp was a rare circumstance. The discharge so commonly met with in an exposed pulp was not suppuration, but a thin, sanious, and very offensive fluid, very rarely containing pus cells, or any cells. He wished it was a suppuration, as then it could be much more easily combated. Suppuration did occasionally occur, but when it did it yielded readily to treatment.

The PRESIDENT said he was sure the meeting would agree with him in the opinion that their best thanks were due to Mr. Coleman for his Report and remarks thereon, and to the gentlemen who had joined in the discussion ; likewise to the donors to the Library and Museum. At their next meeting a paper would be read by Mr. Browne-Mason, of Exeter, upon "The Treatment of Irregularities in the Teeth."

GENERAL MONTHLY MEETING,

Monday, May 5, 1873.

ISAAC SHEFFIELD, Esq., PRESIDENT, IN THE CHAIR.

THE Minutes of the previous Meeting were read and confirmed.

Mr. ISIDORE LYONS, M.R.C.S., L.R.C.P. Edin., L.D.S., &c., was nominated for non-resident membership.

The following donations to the Library were announced : viz., Two numbers of the *Microscopic Journal* from the Editor.

The following donations to the Museum were announced :—

Two upper bicuspid teeth, each with three well-developed fangs, presented by Mr. TURNER.

A case illustrating a very close bite, by Mr. DAVIDSON, presented through Mr. C. J. Fox.

Models of a case (see page 182) of irregularity treated and presented by the Curator.

The PRESIDENT said he was informed that Mr. Fletcher, of Warrington, was present, and that he was desirous of making some observations upon the discussion which took place at their last meeting in respect to his white plastic filling.

Mr. FLETCHER said, that during the last two or three months he had been experimenting further upon his white filling, and he found it was quite easy to control, to any extent, the solubility of the oxide of zinc ; but the very insoluble forms of the oxide of zinc were but little used, because a certain amount of solubility was necessary to enable them to combine with the chloride solution, otherwise the compound would not set ; and as the same fault would exist in all compounds of the same nature containing water in combination, it was therefore quite useless to look forward to a really perfect filling in anything of the kind. Having made some oxides which were as insoluble as could be employed as a cement, he found that they were very much too soluble to use with any certainty ; and on examining the other white fillings sold, found that they were all protected by some mechanical means, either with clay or glass ; but all these protections were simply mixtures. They were loosely mixed, and the slightest attempt at solution caused them to break away and fall off. The process that he was now carrying out was, to cover the grains of oxide of zinc with an insoluble substance, and to cover them in such a way that the protecting substance should be firm and fast,—a firm coating over each grain. When it was prepared in that way, of course the oxide of zinc was protected from action, and was of no use until the lumps were broken up. The less those lumps were broken up the better, because less of the soluble surface was then exposed. He noticed that, at the last meeting, Mr. Sercombe mentioned that he ground his material up in a mortar, making the colour lighter. In doing so he broke up the grains more completely, and made the oxychloride more soluble, as he would have found had he tested it. Heavy force should not be employed in mixing it. If the mixing were done quickly, the compound became in a short time perfectly plastic and smooth, without the necessity of breaking up the grains any further ; and he thought, if used in that form, it might be depended upon as a permanent filling, judging by his own experience up to the present time. He was still carrying on experiments with regard to the means of affording

a mechanical protection to the grains of oxide, and it was very possible that some considerable improvement might be effected. He had brought with him the spatula he used—one made by Johnson and Matthey—which he considered was a good form ; with it you could not apply force sufficient to break up the grains. The spatula was a stiff platina blade with ivory handle.

Mr. COLEMAN was sure they must all be pleased to see Mr. Fletcher present, knowing that he had worked energetically, and he could truly say unselfishly, upon a matter of great importance to them all. There was one question he should like him to explain—he took infinite pains in the preparation of his oxide, and obtained it in a form in which he believed no chemist had yet obtained it ; but when mixed with the liquid chloride of zinc, might it not, to a great extent, lose that condition upon which he placed so much importance—that was to say, when it became an oxychloride, did it not then, to a considerable extent, represent the other oxychlorides in its degree of resistance ?

Mr. FLETCHER.—It certainly did not. In making the chloride, the crystals were not dissolved, except on the surface, and it was easy to prove that their nature was not altered. His own test was very simple—the test of the solubility of the oxide prepared in different ways after it was made into a cement. When the oxide, as he prepared it, was made up as a cement, without any mechanical protection of any kind, it was so intensely hard that he could not touch it except with a very sharp steel tool. It was almost as hard as glass, and even then it was still more soluble than was necessary for a filling, although less soluble than the ordinary oxychlorides ; and he had to depend on the mechanical protection to one side of each grain. Each grain was, as it were, a nut with a shell around it, and when broken up, one side was soluble and the other not. This he could get very closely in practice. The grains were really in that condition, because in making the powder he sifted it through silk sieves of a certain gauge, covered it with

the insoluble coating, sifted it through other sieves of definite gauges, then broke it up and sifted it through others; and he got it in such a condition that almost every grain had a soluble and insoluble side; but certainly the oxide, after it was prepared, was very much more insoluble, and made a much harder cement than when prepared in the ordinary way. There were many different ways of making insoluble oxides of zinc; he thought he had worked some thirteen or fourteen different ones.

Mr. COLEMAN.—You regard your preparation when mixed rather as a combination of an oxychloride with an oxide, than a pure oxychloride of zinc?

Mr. FLETCHER.—It forms a mixture of the 6- and 9-basic salts, but there is a considerable quantity of free oxide.

Mr. TOMES.—When he had made up the oxychloride of zinc, using the ordinary oxides of zinc in a very fine state of division, he uniformly failed in getting complete combination. Using the oxychloride of zinc in the state Mr. Fletcher produced it, it seemed to him that the uncertainty would be very much greater as to what you would eventually get. You would not get complete chemical combination of all those things which were needed to combine—that is, you would have left in it free oxide of zinc and free chloride. If you made it into a form in which it was only accessible with difficulty to the chloride of zinc, it seemed to him that you ran the risk of making your ultimate compound very uncertain.

Mr. FLETCHER.—That had always a tendency to correct itself. A mixture of that kind, to a certain extent, in a moist state, got gradually uniform. In the course of an hour or two he thought you would find, if the mixture were not really a good one at first, it would adjust itself. The cement was a mixture of the 6- and 9-basic salts and free oxide, but the thing to be depended on was the presence of a large proportion of insoluble oxide, and the insoluble coating of the grains, which latter was the most important point, because it reduced the solubility to

not more than one-third of what the oxide was alone. He had been in the habit of testing samples constantly—sometimes seven or eight a day—and he found that the solubility was almost identical in every case. There was the merest trace of variation—certainly not two per cent.—between the different samples, and the face left was always flat and level. There was no pitting, as there would be if there were an excess of free chloride in different places. If you took a flat surface and dissolved it away in acid, the surface remained flat; if the mixture were unequal, it would pit and become irregular.

Mr. HUNT would like to ask Mr. Fletcher if he had ever tried experiments with a sample which had been allowed to set on a glass slab where the under surface was polished, and would show, therefore, the smallest trace of solution? The smallest particle would immediately appear if it were dissolved away. The polish would be gone in no time.

Mr. FLETCHER.—All his experiments, so far as solubility was concerned, had been on round blocks under a mould, so as to get them exactly uniform in size, thickness, and, as nearly as possible, in weight; but the surfaces had been got perfectly flat, and they had been polished with a burnisher.

Mr. HUNT had tried Mr. Fletcher's composition in cases that would be likely to test it rather severely. Take, for example, those cases that they met with in young patients, where the teeth were white and chalky, and there was a small cavity close to the margin of the gum. He had inserted most carefully gold plugs in such cases, and, having done his best, had often utterly failed. In two or three cases of that sort he had used Fletcher's composition, thinking that it would be a good test of its value. Of course he could only speak from the experience of a few months, but those few months, so far as he could judge, made him rather sanguine as to its value. Though not yet perfect, he believed they had now an oxychloride superior to any that had yet been introduced.

Mr. FAIRBANK did not wish to say anything disparaging in regard to Mr. Fletcher's cement, but he certainly did not entertain quite such sanguine views respecting it as did Mr. Fletcher. He thought that the grains had not the same power of cohesion that other white fillings had ; and he thought, also, that where there was any friction, the filling would not be found to stand better than any of the other white fillings. The compound certainly did not mix well. The grains did not seem to be soluble in the fluid, and if you put in the filling in the most careful manner, after it had set it was very easy indeed to scrape off any portion, and to separate the grains. There was, however, no doubt that in some cases it was preferable to the more irritating white fillings ; for instance, where you desired to cap over nerves. It had also an advantage from the quickness with which it set. Where a lower tooth was decayed down to the gum, and you could not apply the rubber-dam, this cement set so quickly that you could keep the mouth dry with a napkin, and then the cement would last longer than Guillois' or any other kind which took longer to set. He thought it was perfectly absurd to compare any of the oxychloride fillings with gold in regard to durability.

Mr. FLETCHER thought it was evident, from what Mr. Fairbank had said, that when he had used the cement the materials had not been worked together. The amount of hardness and toughness depended entirely on the amount of working it got. If worked with a spatula, it became as soft and smooth as modelling clay. He thought, from the remarks at the last meeting, that the instructions supplied had not been attended to, and that it had not been thoroughly worked.

On the Treatment of Irregularities in the Teeth.

By J. T. BROWNE-MASON.

MR. PRESIDENT AND GENTLEMEN,—

It is not without very considerable diffidence that I appear before the Society to-night, to read a paper on the treatment of irregularities of position in the permanent teeth; and although our President suggested I should do so in a way that was very flattering, I still fear that some of my more experienced brethren in the profession may think that for a country practitioner, still young in his career, to air his ideas on such a subject before such a number of his seniors as I see present to-night, is great presumption. I trust, however, they will remember that although I must speak mainly in the first person, as if the work I shall describe were mine, I here bear tribute to the source of my professional knowledge—namely, my partner, Mr. Thomas Sheffield—and that they will acquit me of any egotism that may appear to crop up in what I shall say this evening.

I do not attempt here to make any observations on the cause of dental irregularities, on which exhaustive papers have been read before this Society by Messrs. Cartwright and Coleman; that by the former on the 2nd of May, 1864,—that by

the latter on the 6th of February, 1865 ; but simply to give what I have found the readiest way of reducing such irregularities as we most commonly meet with, hoping that I may bring before, at least the younger members, some experiences worth their attention.

I propose to divide our subject to-night into two heads : first, the treatment of cases not requiring mechanical appliances ; secondly, cases that need such aid.

The first-named cases are frequently the result of the crowding of the teeth by pressure forwards of the back teeth ; and here I would note, not only a remedy for the mischief, but its frequent cause, that is, want of space for the permanent teeth, owing to the removal of the temporary ones before they would naturally fall out ; and hence I take every means practicable to retain the temporary molars as long as possible, for the removal of a second temporary molar at an early period will often cause the first permanent molar to encroach on the space to be hereafter occupied by the bicuspid of the second set to the extent of the whole width of the extracted tooth, and always to a very considerable degree ; I therefore urge that such teeth be filled if at any time caries set up in them.

And now, with regard to the treatment of irregularities caused by insufficiency of room. To get the

offending teeth into the dental arch, it is clear that we can only make room for them by the withdrawal of others. To begin with the central incisors in either jaw : crowding will often make them diverge either outwards or inwards, or cause them to grow in such a manner as to present the sides of the tooth to the front, instead of its labial surface. This crowding may be the result of undue retention of the milk predecessor of the offending tooth. The obvious treatment is, the removal of the milk lateral incisor ; and I find that if we give room in that way, we obtain our end in many cases without having to resort to the aid of correction-plates, which I think are at times applied when they are not required. The lateral incisors are often the subject of similar displacement, and must have similar treatment, the temporary canines being removed to make way for them.

The bicuspid, unless their space has been lost by the early removal of the milk molars, find their way into their normal places without much trouble, for their predecessors leave them abundance of room. Should they, however, be pushed out of place, I should not hesitate to remove the bicuspid, for its room would, under the circumstances, be an advantage.

The canines are very frequently thrust out of the dental arch by want of room. Sometimes, in Nature's efforts to squeeze them in, such pressure

is produced on the incisors as to make them overlap each other; occasionally cases will be found where the lateral and bicuspid are completely touching, leaving no room for the canine at all. My mode of procedure in such a case is to leave the six front teeth intact, and sacrifice a bicuspid, or first molar, on each side. Which of the two is to be the tooth sacrificed must depend on circumstances. If the molars and bicuspid are all quite sound, and the mouth is not very crowded, the removal of the first bicuspid on each side will set the mouth straight in the readiest way, the canines quickly subsiding into the spaces thus created. But if, as is very often the case, the first molars are the seat of disease, then, if the bicuspid are not much developed, or their antagonistic teeth come sufficiently through the gum for their cusps to interlock, the removal of the faulty molar would be preferable to the withdrawal of a sound bicuspid; and if, as above stated, the antagonistic bicuspid have not come together sufficiently to prevent their dropping back, I still think the first molar, even if sound (if a tooth has to be sacrificed for room), is the best to be extracted; for it is much more frequently the seat of disease than the bicuspid. But of course it must be seen that nothing will prevent the bicuspid falling back, or the object will not be obtained. A very admirable paper on the "Removal of the four first permanent

molars in certain cases, at an early period of life," was read by Mr. S. Maclean, before this Society, on the 28th February, 1857, to which I would refer members for further information on this subject.

Now, with regard to the treatment by mechanical aid. I find the cases in which the lower jaw requires such assistance so rare that I cannot give any examples of it, for I have almost invariably found that when there is sufficient room in the lower jaw the teeth will arrange themselves; and although, as in a very recent case in my practice, of which I will presently describe the treatment, a tooth has been forced out of its place by the malposition of its antagonist (fig. 1, Case II.), take away the cause, and the effect is sure to follow. In these models, you see, the upper right central incisor keeps the lower lateral incisor forward and twisted in the jaw, at the same time acting as a wedge and separating it from its neighbouring central incisor. The mechanical treatment of the offending upper central will completely right this, although it was not quite in place at the time these second models were taken; after the plate on the upper jaw had been worn only thirteen days (fig. 2, Case II.). Still there is in this short time evident improvement; and thus you will find that most of the irregularities of the lower jaw will be reduced by nature, provided, as before said, there is room in the jaw.

CASE No. I.—The upper jaw in this case presents the most easily rectified irregularity that we come across—namely, when the central incisors stand twisted with regard to the dental arch. The

CASE I.



Fig. 1.

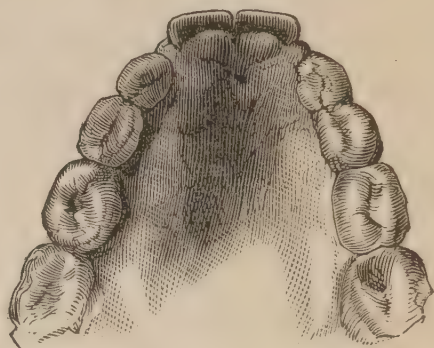


Fig. 2.

readiest way of rectifying such cases that occurs to my mind is by a process that I call actual torsion, and which I learnt from my partner and professional instructor, Mr. Thomas Sheffield; and though it has been for a very long period carried out by him, I have not heard of its adoption by any one except his pupils; amongst them I would especially name Mr. Woodhouse, who has, I believe, alluded to this operation at a previous meeting of this Society, as carried out successfully by him. This plan requires, as an element of success, that when the tooth or teeth are turned on their own axes, they shall be quite in their place without further operation. I cannot find any models in which I have carried out this plan, so I must describe it by means of these drawings (see fig. 1, Case I.), for I regret that I have

very rarely kept the models from which I have worked, having given them to the patients. Our model being taken, the tooth or teeth must be turned and corrected on it (see fig. 2, Case I.), and then a plate fitted accurately round the inside of the incisors, coming quite to the inner edge of these teeth, capping the temporary molars, and extending back over the masticating surface of the permanent first molars, to prevent these teeth rising in the jaw whilst the plate is worn, which would interfere with the bite when the plate is left off. The caps must go well under the gum of the temporary molars, so as to firmly grip the necks of these teeth, otherwise the plate will not be perfectly steady, but apt to slip : there should be a piece of plate to thicken the caps over the grinding surfaces, and this thickening should be considerable over the first temporary molar, and less over the second temporary molar, ceasing with that tooth. If this extra thickness is not placed on the caps, you will find, when the plate is in the mouth and the mouth closed, there would be no bite except on the last teeth on each side, and the patient would then have difficulty in masticating whilst the plate is worn. I like to have the bearing hard on the first milk molar, and if found too hard on that tooth a sharp sculptor will soon remove the points borne on, for after our plate is in its place, as will presently be seen, it should not have to be removed for some

time. A bar must also be carried from first molar to first molar, fitting close to the outside of the central teeth, to keep them steady when turned. When the plate is ready, I seize the tooth or teeth with a pair of forceps, like a pair of broad, flat pliers, the biting surface of the jaws of the instrument being covered with lint or chamois-leather, to prevent injury to the enamel of the teeth. Then, with a steady twist I revolve the offending tooth or teeth in their sockets, and immediately place on the plate, and the work is done. I have never seen any unpleasant effects from the torsion in this way, the pulp not being injured by the process ; for I am continually meeting with patients who have been treated by Mr. Sheffield thus many years ago. I knew of one case thus operated on—quite thirty years since—in which the condition of the turned teeth is in every way satisfactory. After the operation, a cooling lotion is required, to keep down any inflammation ; and the plate must be constantly worn during a period of from four to six months, to ensure their not relapsing into their old position.

In CASE No. II., which differs from the last, inasmuch as one tooth has to be brought forward as well as turned, I have chosen a motive power of which I am very fond in the treatment of these cases, as I find it particularly manageable and quick in operation. I fit a plate as already described, only without tampering with the cast in

any way, a screw being brought to bear on the teeth that require correction at about the point where the distal-lateral and lingual surfaces of

CASE II.



Fig. 1.



Fig. 2.



Fig. 3.

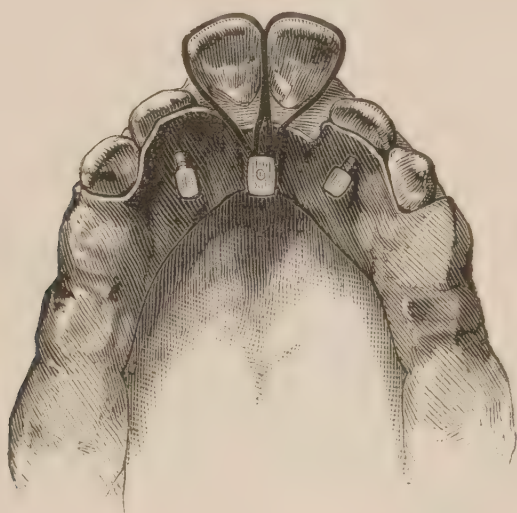
the tooth form their junction, whilst a rigid bar is carried round from first molar to first molar, to

determine the degree of prominence, in order that the teeth may not, by the pressure of the screw, be thrust too far out, but, by the restraining action of the bar, be revolved on their own axes when the desired prominence is gained (see fig. 3, Case II.). The screw should be turned every morning and evening if practicable, until as much pressure is produced as the patient can bear; if necessary, the advancing tooth must be followed by building up plate behind it, a fresh screw being inserted as required. By this means, in nine visits, extending over seven days, a complete correction was made of the offending teeth in the case before you. After the teeth are in position, I take a fresh cast, and adjust my plate and bar to retain the teeth in their places; the apparatus is then worn by the patient some four to six months, to ensure the teeth retaining their new positions, the hold of the caps having been slackened to allow the patient to remove the plate for the purpose of cleaning it and his teeth.

CASE No. III.—This model shows a case requiring the lateral incisors to be brought forward and the central incisors back; here, as absorption of the fangs of the temporary molars was commencing, I had to cap the permanent molars to assist in supporting my plate. You will perceive the second temporary molar was gone on the left side of the mouth. I used with success two screws on the

laterals, and brought back the centrals by means of India-rubber bands carried from the button in the palate over the teeth in question, and by this means soon drew them back. A bar had to be placed, and the plate readjusted when the teeth were in position to retain them there, as in the last case. I find this bar always necessary when teeth have been brought back or turned, but not need-

CASE III.



ful when simply pushed forwards. India-rubber bands will be often found useful to draw teeth together which are separated, or backward when too prominent; but, although self-acting, they require frequent watching, as I had a case brought to me on one occasion where an elastic India-rubber band having been placed on a central tooth, and left there to draw it nearer to its companion central, the band being carried for the purpose round the central, lateral, and canine of the side

towards which the offending tooth had to move; the patient left the town where he was residing when the band was thus placed to come to Exeter to school, and in a few days he was brought to me with the tooth so loose, that I found a plate to support it in position was necessary, the tooth being absolutely on the point of dropping out. The patient said the band had been put on a little more than a week.

CASE No. 4.—This case is one in which you will perceive the four upper incisors fell completely

CASE IV.



within the teeth of the lower jaw, leaving far too little room for the canines and bicuspid, and causing the upper lip to be very flattened, giving an undue prominence to the lower jaw. When the mouth was closed, the lower shut so completely over the upper teeth that the latter were entirely covered (see Case IV.) I constructed a plate capping the milk molars and extending back over the masti-

eating surfaces of the first permanent molars; to enable me to keep the front teeth sufficiently apart for them to clear the lower teeth, I had to make the grinding surfaces of the caps of unusual thickness; a screw was placed against the lingual surface of each tooth, to be pushed forward. The plate was placed in the mouth on Wednesday, April the 9th. By Friday, the 18th, I had moved the teeth as far as is shown in this cast, and by the 30th they were completely over the under ones, so that I was enabled to dispense with any further pressure. I have here the plate I put on in the first instance, and I prepared a second plate on the cast taken on the 18th, that I might bring the original with me. The screws, as they appear at present in the plate, are not exactly where they were at starting, for then they bore about the centre of each tooth to be pushed forward, but they had to be shifted to suit the exigencies of the case, as some of the teeth showed, in their advance, a disposition to turn, and, of course, the screws had to be altered in position to counteract this. I have not brought the cast representing the correction of this case, as I found, from the great distance the teeth had been moved, that they dropped so far back, on losing the support of the plate, that it was impossible to obtain a correct impression in the present condition of the mouth. The plate in this case should not be left off for a

couple of months, to ensure the permanence of the correction.

CASE V.—I have hitherto referred mainly to pushing teeth forward, but the case to which I

CASE V.

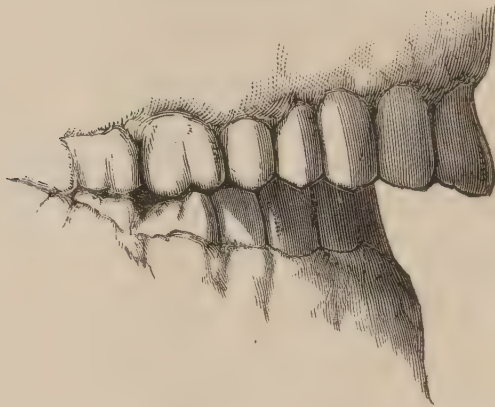


Fig. 1.



Fig. 2.

would now draw your attention was of an opposite character, and decidedly the most obstinate I have ever had, and the one I consider that best demonstrates the usefulness of the screw as a means of moving abnormally-situated teeth. By the aid of some letters written at the time by the young

lady to her mother, I am enabled to give the following details. Before, however, describing the means I used to correct this case, I would direct your notice to the evident fact that plenty of space in this instance would not have remedied the prominence of these teeth; for although it was necessary to extract teeth, still, from the large spaces existing between the teeth when she was brought to me, this prominence could not have been entirely due to overcrowding.

The young lady, then twenty years of age, came to me in the second week of September, 1867. I found the teeth, as in these models, the upper ones very much projected, with an extremely wide space between the central incisors. The bite was exceedingly awkward on the left side, where, when the mouth was closed, the two bicuspid stood so much out that they overhung the antagonistic teeth, instead of fairly falling on them; and on that side of the mouth the first molars above and below had been removed, I cannot say at what period, but some time before I knew her.

I fitted a gold plate, capping the first and second molars and second bicuspid on the right side, and the bicuspid and second molar on the left side, carrying the plate across the palate within the line I intended the front teeth to take. I extracted the first bicuspid on the right side before I put on the plate, and my first endeavours

to move the teeth were with stiff India-rubber bands passed over the front teeth, and a button placed in the plate in the centre of the palate, as in Case No. III.

The plate and bands were put on first on the 13th of September, the bands being changed every day, as they lost some of their elasticity after they had been worn about twenty-four hours; but I found them utterly fail in the attainment of my object, for by the 24th of September I could report no progress.

On the following day I carried a stout gold bar round the outside of the teeth, with a screw bearing on the centre of the labial surface of each of the four incisors; these were screwed up as much as could be twice a day generally, and as the teeth were moved the bar was shortened to follow up the work. By the 15th of October the teeth were brought back, with what success this cast, taken recently, after the lapse of about five and a half years, will show (see Case V., fig. 2). By it you will see the space whence the right bicuspid was removed is almost closed up, and the central teeth have only a slight separation. I adjusted a plate and bar, which were worn constantly for many months after, and then by night only, for a period of, I believe, two years. It can easily be put on now, and the young lady still wears it occasionally at night, although

I do not think it necessary. I found that the incisors, after they were brought back were very awkwardly long; I therefore removed some of their extra length with the file. When I first saw this case I feared that if brought back the teeth would be apt to relapse into their old places, and suggested that the shortest way would be to remove the offenders, and wear the incisors and canines on a plate, but the young lady elected to have their correction attempted, and I think the result was a success.

In conclusion, with regard to the age at which this work should be done, I prefer to correct these cases as early as possible after they show the necessity for mechanical assistance. The last-mentioned case will show that it can be accomplished much later, although with a great deal of additional trouble to the operator, and pain to the patient. I do not find that when plates are put on patients from eight to twelve years of age that they are distressed by wearing them. The fourth example was a delicate little girl, between nine and ten years of age, and, although exceedingly nervous before the commencement of the operations, she seemed, except at her visits to have the screws tightened, to be able to forget the plate altogether. I had frequent opportunities of seeing her, as she made acquaintance with my children, and spent much of her time with them whilst the

work was proceeding. I prefer the use of the screw to compressed wood, for the latter I found occasionally slip out of position, besides being much slower in operation ; and I have a great preference for speedily finishing such cases, as it must necessarily be less trying to the patient, whilst the permanence of the work is not affected by it. I also think the screw more desirable for bringing teeth forward than the inclined plane placed on the lower teeth ; for, by the latter plan, the patient has constant worry, and more especially during meals. From the molar teeth having no bearing, all mastication during the period of the moving the teeth being perforce most imperfect, and the discomfort, to say the least, at those times of the teeth under treatment, tender as they are, striking on the inclined plane, is, I think, much more trying than the pressure of the screw, which only causes discomfort and pain at the time it is moved. Actual torsion should be performed as early as practicable, before the root of the tooth has completed its growth.

Plate of either gold or dental alloy is more manageable than vulcanite, as it is easier to follow up advantages gained by building up plate than by taking a fresh cast, and by making almost a new frame when the changes of the mouth require it. If it is asked whether the success justifies the means used in moving the teeth that are abnor-

mally situated, my answer is, that I consider the patient is amply repaid for anything he or she may undergo, for I have seen very few cases where the teeth have relapsed, and I have found such cases were attributable to patients leaving off the plates too soon, and are generally those where the teeth have had to be pushed back ; when the reverse has been the case, the lower antagonistic teeth keep them effectually in their places.

I trust you will not consider that I have taken up too much of your valuable time by these remarks, and that they may be accepted by you in the spirit in which they are offered. I have now only to thank you for your kind and patient attention.

DISCUSSION.

Mr. WOODHOUSE.—Since Mr. Mason had mentioned his name in relation to the operation of torsion, he thought it his bounden duty to say a few words, especially as he had had the pleasure and honour of being a pupil of Mr. Thomas Sheffield. He must take exception to some few remarks made by Mr. Mason. He should not consider No. I. case as one suitable for torsion. The central incisors being close together, and representing in form the letter V, there would not, when torsion was performed, be room for them in the dental arch. He quite agreed with what Mr. Mason said as to the time when torsion should be done—that was before the apex of the fang was perfectly ossified ; but he always allowed sufficient space between the two centrals before he operated. If there were not sufficient space, he would endeavour to make it, either by an india-rubber wedge or some such appliance. He had two cases of torsion now in hand. It was an established operation with him, and he had never seen any ill result follow. Mr. Mason had spoken of leaving a plate upon the tooth for from four to six months. He had never found it necessary to continue it for longer than two or three weeks. In two or three weeks the re-adhesion of the dental membrane would take place. He then removed the plate, and never knew any ill result to follow. Formerly, when he was a pupil of Mr. Thomas Sheffield, they never made a plate at all. They used to turn the teeth, and leave them to take their chance, and they never knew any ill result to follow ; but to make surety doubly sure, he now used a plate. In constructing it he adopted two plans. One was to model the plaster tooth till it assumed the required position, and then strike up a plate to it ; but he thought the better way was to cast the model with a common pin, in the tooth to be rotated, and when the plaster had set, saw it nearly through, and rotate it to its desired position, and then strike

up the plate to it. He did not think he had anything further to say as regarded torsion ; but his friend Mr. Mummary had had a very long and great experience, and he was sure he would favour them on the subject.

Mr. MUMMERY had not designed to say anything ; but there was one point upon which he should like to say a few words, and that was on the preference which Mr. Mason appeared to give to the sacrificing of the first permanent molar, rather than of a bicuspid, other things being equal. From long and patient observation upon children at an early age, he had come to the conclusion that, if they instructed parents to carefully watch the first molars, they would be able to deal with them early, and save a vast proportion of them. They were lost not so much because they had a predisposing tendency to decay in their structure over other teeth, but because they were supposed to be teeth of the first set, and were hence neglected. Even intelligent medical men were often thus misled, as in a case recently under his care. He thought the first molars ought not to be sacrificed if possible, because they supported the mouth during the time the changes were taking place, when the permanent teeth were being substituted for the temporary, and therefore they formed a solid platform on each side, which sustained the jaws, and he believed very often the bicuspid were not developed to anything like their full length, because those permanent molars were too early lost. Another thing he had found was, that it was necessary to wait until the second molar was thoroughly developed up to the level of the first, if he were going to sacrifice the latter, otherwise the second molar came forward, and you got an imperfect apposition of the teeth. He thought, therefore, it was a matter of very grave importance to keep watch over the first molars. He always laid great stress upon the frequent use of the tooth-brush, and where his young patients had adopted the practice, the best results had followed. With reference to cases of exceedingly protruding upper maxillæ, there, as he understood, Mr. Mason operated on the whole of the front teeth at once.

His plan had always been to operate on the canines first, then to extend his springs to the laterals, and lastly to the centres. He had then had the arch more under control. To the use of compressed wood he much preferred the elasticity of well-hammered gold: its employment enabled the patient to remove the plate frequently, and this practice he always urged upon his patients, to prevent the injury which accumulation of food was sure to inflict upon the teeth.

Mr. C. S. TOMES had heard from Mr. Mason, with surprise, that the operation of torsion was confined to his partner (Mr. Sheffield) and his pupils. He was always under the impression that torsion was one of the recognized operations in the dental surgery of the day. It was an established practice at the Dental Hospital, as well as in the hands, he believed, of most practitioners. To whom the credit of originating that operation was due he was not able to say, but that it was confined to the pupils of one particular gentleman he was unprepared to hear. There was one class of cases which had not been touched upon that evening: he had a model illustrating them in his hand, which he brought for presentation to the Museum. The cases he alluded to were those when the front teeth would not meet. When from some such cause as enlargement of the tonsils the patient was in the habit of breathing with the mouth open, and the teeth got into such a position as he had described. In the case in question the only teeth meeting on one side of the mouth were the second molars; on the other side the second molars, the first molars, and the bicuspid. In that case the treatment adopted was very simple. The first bicuspid had been extracted before the case came under his hands, at which time the first molars in the upper jaw were excessively carious, and were removed; the bicuspid then were pushed out by means of wooden wedges, whilst the remaining teeth, the canines and the laterals on either side, were drawn out towards a band which was carried round in front of all the teeth. That band had also the effect, to a certain extent, of twisting round the central incisors on their axes. When the teeth of the upper jaw had

been brought into such a position that they would pass in front of the lower teeth, he began to attempt to close the mouth by means of an elastic apparatus, consisting of an air-cushion to receive the chin, and a wide elastic band passing across the top of the head. The only trouble in wearing this was, that the chin got exceedingly sore ; but the patient being very persevering, the whole case was brought to a favourable termination within six months. The second model represented it as he left it. The only question that arose was, How did the mouth become shut ? Was it by the lengthening of the front teeth, or by a change of the shape of the jaws, or by forcing the back teeth further into their sockets ? He thought the latter explanation the true one, because when he began to produce an effect it went on exceedingly rapidly ; so that, seeing the patient at intervals of four days, a piece of wax which would go between the teeth one visit, would not go between on the next. He should hardly have brought this case forward now, had it not been one of some interest, and Mr. Coleman had persuaded him to mention it.

Mr. COLEMAN said he was very glad he had urged Mr. Tomes to bring his interesting case before the Society. It had led to the expression of a view which he believed was quite original, and which, if proved to be correct, might greatly aid them in treating some of the most unmanageable cases of irregularity they had to deal with. The opinion expressed,—that by continued pressure teeth might be driven, so to speak, further into their sockets,—did not appear unreasonable, when they recollected how soon teeth, relieved from their ordinary pressure by the removal of their antagonists, became extruded from their sockets. He had tried the plan adopted by Mr. Tomes in some few cases, but without much success, in consequence of the carelessness of the patients, and their dislike to the apparatus, which was certainly anything but comfortable, and a frequent cause of headache. In one case—that of a patient in St. Bartholomew's Hospital—a little girl of about thirteen years of age, who was suffering

from the results of a burn, and whose lower jaw, owing to the contraction of cicatrices closely resembled that excellently figured in Mr. Tomes's Manual, as distorted from the same cause, much good was effected by the wearing of such an appliance for some months. But here the jaw itself was actually acted upon ; and a jaw thus distorted would no doubt be more easily returned to its original condition than would a jaw be flexed from the condition in which it had been originally developed.

Mr. HUNT, coming as he did from the country, said it was exceedingly refreshing to listen to such cases as Mr. Tomes had mentioned, of patients having so much patience. He would mention, in contrast to Mr. Tomes's case, that of a gentleman in whose mouth the only antagonistic teeth were the second molars. The gentleman was 60 years of age, and he had had the opportunity of watching the case for some years, for the gentleman happened to be his own father. Here the continued pressure of mastication for years had not affected those molars, and had not driven them down into their sockets. On the other hand, he knew of a case, that of an elderly gentleman, in whom a lower molar had actually been driven below the level of the gum, through the continued pressure of an uneven bite, and necessitated the capping of some of his other teeth ; but eventually it had to be extracted. With regard to the length of time occupied in the treatment of irregularities, he might say that in the country rapidity of action was a very great point. The screw he noticed in the diagrams seemed to him to be considerably in the way of the tongue : he certainly much preferred them to wooden pegs. In his practice he gave them a screw-head, and furnished the patient with a screw-driver to act upon them from time to time. The patients were in that way able to regulate the pressure themselves. He allowed them sometimes to go away for a month, sometimes even longer ; and in very many cases he found them come back with the tooth moved almost to the full extent desired. He found that it was very necessary to do this in the country,

as patients could not come and pay visits every two or three days.

Mr. HARDING could fully endorse what had fallen from Mr. C. S. Tomes as to the torsion of the incisors. He remembered seeing Mr. Tomes, sen., turn some teeth, twelve years ago, at the Dental Hospital; and he had recently seen a tooth which his own father had turned sixteen years ago. It was a little discoloured, but still there it was. He remembered perfectly well a case of irregularity with which he had a great deal of trouble, in which the whole bite was on one single bicuspid, which had been moved and had become elongated. He was in a dilemma, and took the case to Mr. Tomes, sen., to show to him, and he said, "You have only to wait a week, and you will find that the whole of the teeth will meet;" and sure enough, in a week or ten days, the bite was perfectly right. As to Mr. Mason's wholesale condemnation of the first molars, he thought, if he would look carefully at many of his patients who had arrived at the age of forty or forty-five, he would see the front teeth had been actually pushed out and knocked about, simply for the want of those first molars which had been sacrificed. The consequence of the practice of removing them commonly was that the bite was thrown thoroughly out of gear; and when in after-life they lost one or two teeth at the back, the whole bite was thrown on the front teeth; and you saw those wretched, loose, wabbling incisors with which every one was but too well acquainted.

Mr. FLETCHER had met with one case of irregularity some years ago with which he was never able to do anything at all. In that case the molars and bicuspid did not meet; the centrals and laterals were the only teeth which met, and the second molars were pretty nearly a quarter of an inch apart. The only thing he could do was to cap the lower molars with a plate, and make an artificial bite. The front teeth were in a perfectly natural position, and the mouth, when closed, looked right. The patient told him that some ten years previous his mouth was right, and the teeth met.

Mr. COLEMAN would like to call attention to one rather special feature of Mr. Mason's treatment, and that was, the very early age at which he appeared to commence it. He had observed in the models sent round that a great deal of trouble and ingenuity had been expended in rectifying the position of the central incisors before the laterals had made their appearance ; and as there was apparently no room for these to come into position, further treatment would be necessary when they were erupted. He had no doubt Mr. Mason had good grounds for adopting his plan, but for his own part he was rather inclined to wait and see what Nature was disposed to do. He thought in most cases they would gain more than they would lose by so doing.

Mr. TURNER said the progress of the change in Mr. Tomes's case was certainly very remarkable. It reminded him of a case which came under his notice a few years ago, in a female who had the lower maxilla fractured in two places. The fracture had been set, and the healing process had gone on satisfactorily ; but when she came to use her mouth, only two of her teeth articulated, and there was a space of perhaps a quarter of an inch between the incisor teeth. On one side of the mouth there was no approximation whatever, and on the other side—the side where the fracture had been—there were only two teeth that came together. He was perfectly puzzled to know what to do. All he could think of was a process of bandaging which brought the back teeth into position, but still permitted the incisors to occupy an abnormal position. The patient could not be persuaded to wear the bandages continuously, otherwise a more favourable result might have been attained ; as it was, it was so far successful that the teeth approximated ; the front incisors, instead of assuming the position which they ought to have assumed, resumed the relative positions which they seemed to occupy before the accident ; the molars assumed their right position, and the mouth presented a much better appearance than before the treatment. The patient would not use the bandages throughout the day, but only wore them in the early part of the morning and in the evening.

Mr. BARRETT said that no doubt the subject was one of great importance; it mattered not how we dealt with some of the cases, whether by rapidly turning the teeth by forceps, or by gradually moving them into place by wooden wedges. Those were comparatively simple cases to them all; the more difficult cases were those resembling No. V. in the diagram. It appeared to him that in the treatment of those cases their attention should be directed more especially to the lower jaw, for he thought that want of proper treatment of the lower jaw often accounted for failure. In looking at the models of No. V., he found the absence of a molar on one side, and the presence of the corresponding tooth on the other; and he also noticed the absence of a bicuspid on one side, and no corresponding absence on the other. He thought that was a material point to be considered in the treatment of those cases. If it were necessary to make room for the drawing in of the teeth, they must extract the teeth uniformly. When he took that model into his hands, it seemed to him to show a very favourable result of the form of treatment employed; but upon a more close examination he found that the bite was not exactly represented by the cast-bite—that was to say, the lower teeth, as represented by the cast-bite, stood one-quarter of an inch at least behind the posterior surface of the upper incisors. That, of course, made a favourable condition for withdrawing the teeth: but when the bite was properly placed, the very opposite condition showed itself; and it would be seen that the lower teeth struck upon the backs of the upper incisors, and for that reason it was they did not find the incisors drawn into their proper position. He therefore contended that the treatment that had been pursued was, with all deference to Mr. Mason, somewhat incorrect. He thought if pains had been taken to draw in the lower incisors clear of the posterior surfaces of the upper incisors, a better result in the long run would have been obtained.

Mr. DENNANT thought they must all coincide with what Mr. Mummery had said about the wholesale sacrifice of the six-

year-old molars, which so frequently lead to irregularity of the teeth, and inefficient bites. The ignorance upon the part of parents and guardians of their young patients was the common cause of those teeth being lost so early ; and it had often occurred to him that if some authoritative body, such as a committee of their Society or the staff of the Dental Hospital, would draw up a number of very simple hints, which might be called Nursery Hints, to be hung up in the nursery, and referred to, it would be one means of correcting the wide-spread ignorance upon that subject.

Mr. TURNER could not quite agree with the author of the paper in reference to the use of screws, and his depreciation of the wedge. It seemed to him that when you gave the screw half a turn, to get the plate into its place, you must give the tooth on which the screw impinged a jerk, and that the action of the screw was therefore not continuous. With wood, as it was generally used—dovetailed into the regulating plate—you were able to fit it to the tooth which you wished to move, and place the plate exactly in the position you required. You could then trust to the expansion of the wood under the influence of the moisture of the mouth.

Mr. HUNT differed from Mr. Turner in that respect. Although you might dovetail your wood from before backwards, and below downwards, yet in the course of a very few minutes the moisture of the mouth would expand the wedge to its full extent. With the screw you had immediate pressure, and also continuous pressure ; for, the moment the pressure got lessened, the patient was able to increase it.

Mr. MASON, in reply, said there were a few remarks he should like to make. First of all, he would reply to the remark of his friend Mr. Woodhouse, that case No. I. was not a very good case for actual torsion ; and he quite agreed with him. He happened to be a very bad draughtsman, and the drawing made for him ought to have given space between the two central incisors, which he was not able to correct. With regard to his

remark that Mr. Sheffield was the originator of the operation of torsion, though he believed he was, he did not intend to hurt any one's feelings, or to claim any superiority for Mr. Sheffield or his pupils. He did not advocate the removal of the molars until the bicuspid were well through. With regard to the statement that the withdrawal of the first molar materially upset the after-bite, undoubtedly it occasionally did ; still, he thought they would find that the first molar, in nine cases out of ten, had been the repeated object of attention on the part of the dentist. He had seen as many as four or five stoppings, in fact, a stopping on every surface presentable ; and he maintained that when a tooth got in that condition it often brought on dental abscess, and therefore was better out. In case No. V., the front teeth, he considered, had merely to be brought back. They would observe in the lower model of that case that the correction would have been more complete had the bicuspid on the left side of the mouth been brought out. If they withdrew the upper model, they would see that the arch of the lower jaw decidedly fell in, doubtless owing to the removal of the first molar, which was taken out long before he saw the patient. She was no patient of his before she was 20 years of age, and when she came to him her mouth was in the condition they saw represented. At that age, on account of the solidity of the jawbone, he thought it would be almost impossible to bring out the lower teeth ; therefore he contented himself with simply drawing back the upper teeth. He did not at all like the plan of trusting patients to apply the screw themselves. He found they generally contrived to prize off the plates, and to do no good at all. He endeavoured to get them to remain in the town, and, if possible, to see them twice a day. He always liked to remove the plate every three or four days, and he attributed the rapidity with which he got out No. IV. case—for he thought it was rapid—to the fact that he saw the patient twice every day, and only removed the plate once in every two or three days, as necessity required, to shift the screw. He never found that wearing the plate for three weeks or

a month continually, even if covering the molars, ever did any mischief. He thought he might instance the case of No. V., in which the upper molars were kept capped continuously for from six weeks to two months, the plate being removed only when required to alter the screws, and they were the soundest teeth in the patient's head. The only molars that ever had any stopping were the lower ones. With regard to the age at which he attempted to deal with his cases, he was a great advocate for leaving Nature to do all she could; but in No. II., from the peculiarity of the bite, the centrals could not possibly correct themselves, and they were doing actual mischief to the lower teeth, by forcing the laterals aside.

The PRESIDENT.—Gentlemen, I am sure the meeting will gladly accord its thanks to Mr. Mason for his interesting paper, and also to Mr. Fletcher, of Warrington, for the observations he has made on the particular stopping, to which he has given so much time and attention. It is now my privilege to announce—and let me say that, on personal grounds, it is not only a privilege, but a great pleasure—that Mr. Woodhouse has kindly authorized me to intimate that he will prepare a paper to be read before the Society at our June meeting, on the Treatment of the Exposed Pulp—a branch of practice in which he has had considerable experience, and to which he has brought a great amount of professional skill—much, I am convinced, to the comfort and satisfaction of his patients. I need hardly offer my assurance that the paper will be most interesting and valuable to all those who have given their attention to the subject upon which it will treat.

SPECIAL GENERAL MEETING.

Monday, June 9, 1873.

ISAAC SHEFFIELD, Esq., PRESIDENT, IN THE CHAIR.

THE PRESIDENT explained to the Society that the present meeting was called for the purpose of making certain alterations in the Bye-laws. The first alteration was simply to make the Bye-laws conformable to a new Bye-law carried at the last Annual General Meeting, which made the Curator of the Museum *ex-officio* a member of the Council. The second alteration was simply to read the names of the visitors before the Casual Communications were made, so as to enable any present to take part in the discussion upon them. The third, and last alteration, was the introduction of a new Bye-law, to enable the Council to deal in a more satisfactory manner with the papers read at their meetings. There had been misunderstandings upon this subject, and the introduction of the present Bye-law, a very common one in most learned Societies, would, he believed, quite prevent any such in future.

Mr. THOMAS A. ROGERS then proposed that the following alterations be made in the Bye-laws :—

1. In Bye-law LXVI. omit the words "*shall be appointed by the Council and*" after the word Museum, in the first line.
2. In Bye-law LXXII., Order No. 6 to follow Order No. 3.
3. New Bye-law to follow present Bye-law LXXX.
"All papers read before the Society shall become, together with the illustrations and diagrams, the absolute property of the Society, to be dealt with at the discretion of the Council."

Mr. SERCOMBE seconded the proposition, which, after the visitors had withdrawn, was put by the President, and unanimously carried.

GENERAL MONTHLY MEETING.

Monday, June 9, 1873.

ISAAC SHEFFIELD, Esq., PRESIDENT, IN THE CHAIR.

THE minutes of the previous ordinary meeting were read and confirmed.

Dr. BARNHAM, of New York, was recommended by the Council for honorary membership.

The following donations to the Library were announced, viz. :—

“Mahew on the Horse’s Mouth,” presented by Mr. TODD.

“Resections of the Maxillary Bones,” by H. D. Goodwillie, M.D., D.D.S. Presented by the AUTHOR.

Magitot “Memoire sur les Kystes des Machoires,” par Dr. E. Magitot. By the AUTHOR.

The last five numbers of the “Monthly Review of Dental Surgery.” By the EDITOR.

The following donations to the Museum were announced, some of them not having been hitherto inserted owing to the absence from the country of the curator, viz. :—

From Mr. E. ALEX—Model of case of exostosis of jaw ; exostosed teeth, &c.

„ Mr. R. ACKLAND—Upper and lower bone set with natural teeth ; a tooth filed in 1818.

„ Mr. J. H. REDMAN—Models of three cases of abrasion of the teeth ; three-fanged lower molar ; two-fanged cuspidati ; dilacerated incisor.

„ Mr. THOMAS UNDERWOOD—Half of lower jaw excised on account of cystic disease.

- From Mr. J. S. TURNER—Model, showing distortion, produced by a tumour in spheno-maxillary fossa ; also a model showing distortion of alveolar border, due to mucous hypertrophy of the cheek.
- „ Mr. E. SAUNDERS—Model of case of supernumerary incisor.
- „ Mr. J. B. FLETCHER—Teeth abnormal in form.
- „ Mr. J. PARKINSON—Seven models illustrating irregularity of the teeth in position ; two ancient extracting instruments ; twenty-two old bone pieces, some of them much eroded.
- „ Mr. BARTLETT—An ancient form of key instrument.
- „ Mr. D. WATSON—Model, showing a supernumerary lateral incisor.
- „ Mr. O'MEARA, of Simla—Skull of a bear.
- „ Mr. MUMMERY—Lower jaw of a sheep in which is a bony cyst, originating from teeth retained within the jaw-bone.

Mr. LOOKER, of Kingston-on-Thames, exhibited an arrangement for preventing the alteration in a bite which occurs from the expansion of plaster when employed for holding upper and lower models in position. Mr. Looker's plan consisted in attaching each model, when placed in position, to an earthenware tile, with retaining holes in it, care being taken that the plaster securing one model was not in communication with the other.

Mr. SEWILL exhibited a new form of instrument-stand. He had had it constructed after the pattern of a book-stand, invented by Mr. Carter, of New Cavendish Street. By means of racket-work with spring it could be almost instantly adjusted to any height, and, by means of a ball and socket, the shelf carrying the instruments could be moved into any position. A small table ; supported also upon the same pedestal, could be brought close to the patient, and fixed in a position sufficiently firm for all purposes. He believed Mr. Tomes possessed a stand of similar construction.

Mr. T. A. ROGERS had used the reading-desk referred to,

and had found it very useful ; its only drawback was the liability to overturning, but that could be greatly obviated by loading the lower part of the pedestal.

Mr. C. S. TOMES had used that form of stand with much comfort for some two years ; care was required in employing it to secure the ball and socket, otherwise a glass of water rested upon the edge of the shelf would slowly tilt it over and fall, which would be first warning of its insecurity.

Mr. OAKLEY COLES exhibited for Mr. Brunton, of Leeds, his new contour flask, by means of models and a specimen piece vulcanized in it. The arrangement and mode of employment were rendered clear to the meeting.

Mr. CHARLES S. TOMES.—I have a specimen here that has been already mentioned in the Transactions of the Society, although it has never been shown. Some members may recollect that, some months since, I described a very peculiar diseased condition in the teeth of a grampus, which is in the Oxford University Museum, in which the pulp had been opened by the wearing down of the crown, and apparently, as a consequence of the inflammation thus set up, very irregular absorption had taken place both over the surface of the pulp cavity on the one side, and the outer surface of the fang on the other. At that time I was not aware of anything exactly similar having been met with in a human tooth ; but while that description was passing through this press I stumbled on this specimen, to which, unfortunately, there is no history attached. In it the fang of the tooth (a canine) has been attacked and eaten into by absorption around the pulp canal at the end of the fang, and half way up the fang on its outer surface there has also been a perfectly separate centre from which it has been attacked. The peculiar feature of the specimen, however, is this : that this disease must have originated quite externally to the tooth, because the crown is perfectly sound, and at the time it was attacked the pulp was fully alive, and has protected itself by forming secondary dentine, so that the pulp cavity, opposite the upper point of invasion, is entirely obliterated by this secondary dentine. One sometimes meets with these in-

stances of absorption around the pulp canal at the apex of the fang in dead teeth ; but I am not aware of any specimen in

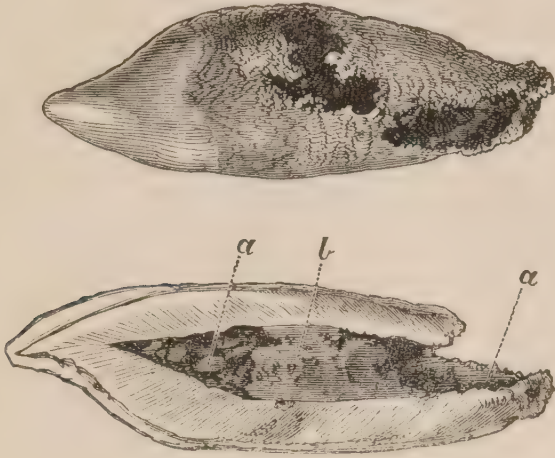


Fig. 1. Outer surface of a canine tooth. The deep irregular excavation seen upon the side of the root is entirely distinct from that which spreads from around the pulp canal at the apex of the root.

Fig. 2. Longitudinal section through the same tooth. At *a a* are detached particles of secondary dentine, whilst at *b* the tooth is quite solid, the pulp-chamber having been wholly obliterated by secondary dentine. The mass of secondary dentine marked *b* corresponds to the excavations. (See on the side of the root—*Fig. 1.*)

which it has happened where there was perfectly living and presumably healthy pulp, as this appears to have been ; for had the pulp been diseased and wasted it is hardly probable that so perfect a deposit of secondary dentine, in complete unity with the walls of the pulp cavity, could have been formed. Again, although it is far from unusual for the fangs of dead teeth to be superficially influenced by absorption, I have never seen any specimen in which a very deep but superficially limited excavation,—such as that at opposite to the point marked *b* in the second figure, going right through into the pulp cavity,—has been produced.

Mr. SEWILL would be happy to present to the Society a root, to which a mineral tooth had been grafted by Mr. Woodhouse twenty-two years ago ; it had become loose, and had set up suppuration. There was not the slightest loosening of the pivot, and the accuracy with which the mineral tooth had

been adapted to the root spoke for itself. He would like to ask Mr. Woodhouse what plan he had adopted for securing the union. Whilst occupying the attention of the meeting, he might, perhaps, allude to another subject, viz., that of drying the cavity of a tooth preparatory to filling. This he now effected by washing it out with absolute alcohol, which evaporated and left a perfectly dry surface ; where a little softened and spongy dentine might have to be left at the bottom of a cavity, such a plan would be found especially useful. Care must, however, be taken that too much was not employed, and the gum injured thereby.

Mr. C. S. TOMES could bear testimony to the value of absolute alcohol for drying the cavities of teeth. It was suggested to him by his late preceptor, Sir B. Brodie. It was much used for drying chemical apparatus. Before filling a cavity with gutta-percha it was a good plan to wash out the cavity with chloroform, for if any of that fluid were left after drying, it being a solvent for gutta-percha, would make it stick well.

Mr. WOODHOUSE, in reply to Mr. Sewill, said that the preparation he employed for fixing a pivoted tooth was a solution of gum copal in ether. He became acquainted with it through Mr. Thomas Sheffield. It was very useful for fixing short mineral teeth to their pins ; it held them much more securely than sulphur.

Mr. T. A. ROGERS, referring to the remarks of Mr. Sewill, had often employed salvolatile with the same object, and also where any decay might have to be left to neutralize any free acid which might exist.

Mr. COLEMAN was frequently in the habit of employing salvolatile with a view to neutralizing the acid found in carious teeth previous to introducing a filling ; and he believed the practice was attended with decidedly beneficial results, especially in the case of young patients, when the progress of caries was usually very rapid.

On the Treatment of Exposed Pulp.

By MR. A. J. WOODHOUSE.

MR. PRESIDENT AND GENTLEMEN,

I HAVE somewhat reluctantly complied with the request of our President to read this paper, as I have already, on the 5th of June, 1865, in a short paper "*On the Use of Carbolic Acid*," described my treatment of certain cases of exposed pulp ; and as my mode of practice since then has not undergone any material modification, I fear I must recapitulate somewhat ; but the subject to-night being more general and extensive, I hope I may be able to interest you, and if to many I have nothing that is new to offer, I hope to some my observations may be found useful, as they are the result of long and careful trial, attended by a considerable amount of success.

I do not propose to enter controversially into the various theories and practices of those who have written on this subject, but rather give you the result of my own practice.

I think it very desirable that members of this Society should thus give their own personal experience, as each has some individual peculiarities

of practice which may be advantageously adopted by others.

The unossified portion of the tissue from which the dentine is formed is called "the pulp," and may be described as composed of arteries, veins, nerves, and possibly cellular tissue ; and is highly sensitive.

It has its uses, or it would not exist : at these we will glance, that we may better appreciate its value to those who consult us. The pulp is the chief means of connecting the tooth vitally with the general economy of the body ; for, although the peridental membrane attaches the tooth to the alveolar process, it, to a very modified extent, conveys life into the dentine ; whereas the pulp, entering into the body of the tooth, conveys sensation and new matter into and throughout the dentine.

It may be difficult to prove this latter assertion by dissection, but not so by reasoning ; for if the dentinal tubes are not sealed up with new matter, how is it that a recently-stopped tooth gradually loses the excessive sensitiveness to heat and cold ? The pulp, by giving sensitiveness to the tooth, probably enables us to feel more readily than we otherwise should any substance between our teeth which would be injurious to them. We are also thus made aware of the advance of decay which would often otherwise proceed without our knowledge until the teeth were entirely lost. And

lastly, while the pulp exists in health the peridental membrane remains healthy, and is not irritated by the propinquity of dead bone.

The pulp in a perfectly sound tooth is entirely concealed from view by the investing dentine, enamel, and cementum. The removal of these by *accident, attrition, decay, or accidentally during an operation*, will expose it. It is with the two last that I propose chiefly to deal; but I will just glance at the two first-mentioned conditions.

1. First, then, of exposure from accident, such as splitting the tooth either through the centre or severing only a portion of the crown either from mastication or a blow: this in the case of premolars or molars generally necessitates their immediate removal, but in incisors and canines extirpation of the pulp is more practicable, and is generally best accomplished by passing a fine softened broach, sharpened to a flat chisel-like edge, to the apex of the root, and rapidly rotating it, thus severing the pulp; the opening into the pulp-chamber can then be enlarged without giving pain, and the mass of the pulp be removed with an ordinary barbed nerve-extractor. (For some time I used those made of small gold wire, so that in the case of a portion being left in the fang discolouration should not take place; but I now find those prepared by S. S. White so good that I prefer them.)

I then syringe the cavity occasionally until the

bleeding ceases, and then pass up to the end of the cavity a few fibres of cotton wool saturated with carbolic acid, and sometimes a little tannin in addition; this I remove after a few minutes, and replace with another little wad similarly charged, which may be left permanently there if bleeding has entirely ceased. Of the other process of pivoting I will not here say anything, being foreign to the purpose of this paper. I have often tried ether spray to deaden the sensibility before thus extirpating a living pulp, but it requires great caution not to impinge the jet upon the pulp, and when it is frozen I have found the tissue so hard as to make it difficult to distinguish it from the dentine: for these two reasons I have therefore ceased to use ether, and prefer, if it is desirable to spare the patient the pain, to have nitrous oxide administered.

2. I will now speak of exposure, or approach to exposure, from attrition.

The patient generally seeks help before the pulp is quite open, and in this case, although the dentine may look pink and be very tender to the touch, if there has not been positive aching, I would seek to preserve it, if, as is generally the case, the surrounding walls of dentine form a basin-shaped cavity. I undercut these walls (for which Morison's engine is beautifully adapted), and, placing a piece of parchment-paper, damped with carbolic acid and dusted over with tannin,

over the most tender portion of the cavity, fill with osteo, cement, or gold, as is most suitable for the case, and the result is generally most satisfactory.

Should, however, the pulp be actually exposed, the irritation already existing would, in my judgment, prevent any chance of saving it by any treatment, and I should proceed to extirpate it with arsenious acid, except in the case of single-fanged teeth, when I should proceed as already described in the cases of fracture from violence.

3. We now come to cases of exposure from decay, and it is in these that excessive care must be taken rightly to diagnose the conditions before deciding on the treatment. We must be tolerably certain of the condition of the pulp, or the result will be mere haphazard.

Should the patient complain that he has been suffering from continued pain, either in the teeth or from facial neuralgia, it is almost a certainty that the pulp is already exposed, and more or less inflamed and suppurating, and consequently, in my experience, not in a condition to be restored to health. I have not yet tried Mr. Oakley Cole's treatment of such cases with "pepsine," so may have to modify my opinion. But the decay in the tooth has often not proceeded so far as this, and the patient tells you that the tooth is sensitive to heat and cold and sweet things; also to food pressing into the cavity, and that the pain sub-

sides in five or ten minutes on each occasion—there having been *no continued toothache*.

In such a case I should have good hope of saving the pulp; but as it is probably only protected by softened dentine, I should in this, as in the foregoing condition, proceed with great caution to prepare the cavity. First, I freely remove the enamel with a broad instrument, cutting then, as afterwards when taking out the decay, from the nerve, thus avoiding the danger of the instrument unintentionally wounding it. At the commencement of the removal of the decay, I press the instrument firmly towards the enamel, and lift it out in flakes rather than cut it; and if, after doing this, the pulp is still covered with softened dentine, I use one of S. S. White's spoon-shaped excavators, and with it scrape away the dentine over the nerve, thus avoiding the danger of entering the cavity, as I might with a finer instrument. This I continue until I have reached healthy bone, or exposed the pulp.

In preparing the tooth, I find the tenderness or non-sensitiveness of the dentine to be a great guide to the condition of the pulp before it is actually reached. If the bone is excessively tender, especially if it is so towards the cusps, and in parts most remote from the nerve, it is a good indication that the pulp is healthy; for it is a proof that it still retains its power to transmit

life through the tubuli, which it ceases to do as soon as suppuration has commenced. If therefore, on the other hand, the patient feels little or no pain until the pulp is reached, it is almost certainly beyond recovery.

I may here remark that I entirely disapprove of the use of gutta-percha as a temporary filling in living teeth in which the nerve is nearly exposed; I prefer in such cases infinitely an osteo-stopping: for these reasons,—it is equally a non-conductor, and it adheres so perfectly to the walls of the cavity as entirely to exclude all moisture; whereas Hill's and Jacob's, though in themselves impervious to moisture, do not so fill the cavity as to exclude the fluids of the mouth, and consequently such teeth filled with them soon begin to irritate, and the pulp has eventually to be sacrificed. But in dead teeth I find such stoppings very useful and lasting. Having then exposed the pulp, and on examination it shows no appearance of having wasted, but the pulp chamber is full, I at once place lightly in contact with it a small pellet of cotton wool, rolled rather loosely and saturated with carbolic acid: in about five minutes I repeat this, pressing it rather more firmly on to the exposed portion of the nerve, and then, after a short interval, examine it. Should it still show signs of bleeding, I repeat the treatment until that ceases; and if the pulp then appears shrunk into the cavity, I at once decide

to destroy it, as I consider this a sure sign that its vitality is lowered, and that it would therefore perish under conservative treatment.

But should it still fill the cavity, and become white under the action of carbolic acid, I should have some hope of saving it, even in cases where there has been a little previous aching. I therefore inquire if the patient will have the opportunity of returning to me in case of pain coming on; and if he will be in my neighbourhood for a month or two I should proceed to stop it, which process I will describe presently when treating of accidental exposure; but if he is going beyond reach of me it is wiser at once to destroy it, as the chances of success, although all looks promising, are very small when a tooth has once ached.

In some cases in which the whole of the decay is apparently removed from a cavity, on closer examination there is one place in which a little white spot, about the $\frac{1}{16}$ of an inch in diameter, appears in the direction of the pulp cavity,—to this I immediately apply the spoon-shaped instrument, and generally find the dentine quite soft and the pulp exposed beneath. I specially mention this condition, as it might escape observation; and should such be the case, and it be treated as one of unexposed pulp, the result will certainly be most unsatisfactory.

The following is my mode of destroying the

pulp. I make a very small wad of cotton-wool at the end of a probe, about $\frac{1}{8}$ of an inch long and $\frac{1}{16}$ in. wide; this I saturate with carbolic acid, and then dip the tip into finely-powdered arsenious acid, taking up about half the bulk of a pin's head; this I place upon the exposed portion of the nerve, pressing it lightly into its place, and then protect it with another wad of cotton-wool saturated with a solution of gum benzoin and tannin dissolved in spirits of wine. I have all these appliances ready before commencing the operation.

If the pulp has decidedly begun to waste, you may promise your patient very little suffering; but if it is nearly perfect and healthy, it is safer to make no such promises; though even then there is certainly less prospect of suffering than when acetate of morphia, creosote, and arsenic are used.

The first dose I generally find sufficient to kill the pulp, but a second and third are sometimes necessary. It is possible to be misled on examining the pulp after it has been dosed, for it is often sensitive to a light touch, but from one piercing its substance little pain is felt, and after it has been thus broken the cavity may be entered without causing pain. This, I think, is due to the unbroken pulp being a sac containing fluid, which, on slight pressure, is made to impinge on the living fibres at the end of the fang, but on

rupturing the external coats of the pulp the fluid escapes, and the substance of the pulp may then be removed with little or no pain. I much prefer removing it from the tooth on the second or third day from applying the arsenious acid, as it then generally comes away entire, whereas the delay of a week or two renders it friable; otherwise I do not find any injurious consequences from leaving the arsenious acid in the tooth for about two weeks, but beyond that time irritation is very apt to come on in the periosteum.

I have already described the mode of removing a living nerve from the pulp-chamber, and the way I treat it afterwards; I follow the same method when it has been dosed with arsenious acid, but in molars it is often impossible to remove the dead pulp from all the roots, some of the cavities being too small to admit an instrument. In such cases I remove it from as many of the roots as I can, fill these cavities, and then place a small piece of cotton-wool dipped in carbolic acid and tannin in the pulp-chamber over those from which I have not removed the deadened pulp, filling over it with osteo or metal at once, or in such cases occasionally with a gutta-percha stopping.

If, as sometimes happens, the pulp has been for some time dead in one of the roots of a molar, and I have to destroy it in the others, and it is impossible to get at the cavity in the root that

has been long dead, I fill the tooth with a cement, and leave a small hole through the stopping by placing a small piece of wire in the pulp-chamber packing round it, and when finished, withdrawing the pin; or I insure vent for the secretion by drilling a small hole into the pulp-chamber, just above the margin of the gum.

I have also for years treated teeth that have been long dead in this way with the most satisfactory results.

I have used various materials for filling roots, —gold, tin, cotton-wool, and osteo; but I generally now adopt the latter, for what is necessary to gain is a complete sealing up of the cavity, especially at the apex of the root; and I find the result is the same whatever material is employed. So long as it accomplishes this, I therefore use that which can be most certainly and easily applied, and I find that in osteo I have this requirement.

I have already described the removal of the pulp and the treatment immediately following it. Having placed a few fibres of cotton-wool, dampened with carbolic acid, and perhaps some tannin, at the very end of the pulp-chamber, I carefully dry the cavity, and having previously mixed a little osteo very thoroughly, so as to make it a smooth, cream-like substance, I surround a very fine softened broach with a few fibres of cotton, charge it freely with the osteo from the spatula, then carefully pump it up into the cavity by

working it out and in, and, on withdrawing the broach, leave the cotton and osteo in the cavity, adding a little more cotton to insure the cavity being perfectly filled.

I have found in roots of upper molars, where it was, from their minuteness, impossible to get the finest broach to carry cotton, that by first thrusting the naked broach as deeply as possible into the fang and rotating it, and then placing a little of the creamy osteo at the opening of the cavity and working the broach in and out, a very good result was obtained.

For capillary attraction, aided by the pumping, carries the osteo nearly or quite throughout the cavity, sealing it up and drying any portion of the dead pulp that may remain within it.

Sometimes patients will apply to us with considerable pain in any of the six upper front teeth; and on examining them it is found that the pulp has wasted from the cavity in the crown, but the symptoms indicate inflammation of that tissue, and the tooth on percussion is not tender, showing that the peridental membrane is not yet affected. In such cases, with my Morison I cut away the inner wall of the tooth until I have an opening in a line with the pulp cavity, and then, having prepared my patient for it, pass up a fine broach, as in the case of a fractured tooth, to the end of the cavity, and I am very pleased if the patient feels the rapid rotation of the instru-

ment, as I then know I can at once give him ease, and preserve his tooth.

In a case of this kind I leave the carbolic acid dressing in the tooth for two or three days, renewing it each day to insure a healthy condition of the vessels at the apex of the fang.

I have often adopted this treatment also in the case of bicuspidis in both jaws with good result, and prefer in such cases the above treatment to using arsenious acid; for so little of the pulp often remains that it would be very difficult and as painful, perhaps more so, to get the arsenious acid in contact with it; and besides this, it is not desirable to place arsenious acid deeply in the root of a tooth.

4. We now come to the last condition of exposure which I mentioned, that of the accidental uncovering of a healthy pulp during operation in a tooth which has not previously ached.

First, it is necessary to find out whether it is really opened, the sudden start of the patient being the only premonitory indication that the nerve has been touched; and this it is often difficult to ascertain, for it is most undesirable to do so with the probe, for with it the membrane would be wounded, and be less likely to be successfully preserved in health. The eye is, of course, the best means of deciding, if the spot can be viewed with or without the aid of the mouth-glass; but should this be impossible, it is a good plan to tell

the patient to suck it : if this produces pain, the probability is that the pulp-chamber is open. A small piece of cotton applied to the part will often confirm the question by coming away tinted with blood. Another test is to syringe on the supposed point of exposure with water at 95 degrees of Fahrenheit : if this produces pain, exposure is pretty certain, as it will not give pain if the chamber has not been entered.

If the nerve is open, I apply cotton saturated with carbolic acid, as already described, until all pain and bleeding cease, and then at once place on it a small disk of parchment paper damped with carbolic acid, and dusted over with tannin, pressing it with a wad of cotton firmly on the nerve, so as to exclude all air, the presence of which is, I believe, very irritating to the wounded pulp, and detrimental to its healing healthily.

If the cavity in the tooth be an interstitial one, care must be taken that the shield does not approach too near to its edge, especially of the part nearest the gum, as if it reached the edge the moisture of the mouth would be apt to insinuate itself beneath it, and so irritate the pulp.

The shield then being in its place, I stop the tooth, either with osteo, which I consider the best, or Sullivan, in either case carefully pressing the stopping, so as to come closely in contact with the parchment paper without driving it into the

pulp. I name these two materials as having these qualities in common; they can be made to fill the cavity with gentle pressure, and they neither shrink, as most other amalgams do and as gutta percha does, and thus admit external moisture. I also object to gold or tin being used in such cases, except with a thickness of osteo between them and the pulp.

Should it be doubtful, after the most careful examination, whether the pulp be exposed or no, the safest plan is to treat the case as one of exposure, in the manner just described.

I generally use Sullivan for filling molars in these cases, as it is more lasting and its blackness is not at the back of the mouth an objection; but for bicuspid and incisors I fill with osteo. In the former I sometimes place a little of Fletcher's amalgam near the gum, and so prolong the duration of the osteo filling, as it is there that it first fails, and there is always a great danger of patients not returning as soon as they ought for the inspection of the filling.

On removing the stopping and examining the exposed pulp after a year or two, I rarely find it ossified, but it is rather sunken and somewhat damp; but the dentine is still very sensitive in all parts of the cavity, thus proving that the vitality is not impaired. In such cases I re-stop them as I filled them in the first place, but I also after a time often remove a portion of the osteo,

and fill over it with gold. I have a great many patients who have had teeth, so treated, in their mouths for years, and have never had the slightest pain from them ; but I also have a very small per cent. of failures.

With such a measure of success in preserving the vitality of teeth, I feel myself fully justified in persevering in this mode of practice.

DISCUSSION.

Mr. THOMAS A. ROGERS said he felt grateful to Mr. Woodhouse for having favoured the Society with an excellent paper at a very short notice. On a former occasion, he might say, he had reason for feeling still more grateful to that gentleman when, during his Presidency, he had, acting upon a hint of his, furnished a most valuable communication on the treatment of the dental pulp through the agency of carbolic acid, which was, he believed, the first public occasion on which that substance was recommended for that purpose. The subject they were considering that evening was one beset with many difficulties, because it seemed almost impossible to lay down any definite laws in regard to the preservation of the dental pulp. Several years ago he read a paper before their Society on capping the exposed pulp; but the only cases in which he could strongly advocate that plan of treatment were then very simple ones—viz., in which a healthy pulp had been exposed in the process of excavation. When the pulp had been exposed in the course of disease, and when it had been treated by arsenic, zinc-chloride, or antimony, the results were by no means so satisfactory; this was the only general conclusion to which he could arrive. Mr. Woodhouse had referred to the removal of the whole pulp, and he agreed with him in the view that it was desirable to immediately fill the fang cavities, after having done so, to prevent as much as possible the access of air. He was not so particular as was Mr. Woodhouse, in those cases where bleeding of the pulp occurred, to wait until its cessation before proceeding to fill the teeth; he did not hesitate to apply sticking-plaster to his finger before a cut had wholly ceased to bleed; and he did not believe a little extravasated blood would prove a source of irritation if left upon the surface of a healthy pulp. He wished they could arrive at some definite law which could guide them as to when

a dental pulp should be destroyed and when it could be preserved.

Mr. SEWILL said Mr. Woodhouse had truly stated that it was most important that they should strive to arrive at a correct diagnosis as to the condition of the dental pulp in order to enable them to treat it rationally. Considerable difference of opinion appeared to prevail upon the actual condition an exposed dental pulp ordinarily presented. Mr. Salter spoke of it as being commonly found under such circumstances in a state of suppuration. Mr. Coleman, on the contrary, maintained that suppuration of the dental pulp was not a common condition of that structure when exposed. He had inclined to the view presented by Mr. Coleman—viz., that the discharge which exuded from an exposed dental pulp partook more of the character of serum than of true pus, but having recently carefully examined the pulps of a number of extracted teeth, both microscopically and otherwise, his opinion was changed, and he believed the effusion was really pus, in the large majority of cases in which the pulp was not in an actually gangrenous condition. He would like to ask Mr. Coleman whether his views were based on his own observations, or on that of others. One other point he would like to say a word upon—viz., the propriety of leaving any portion of softened dentine in the cavity of a tooth. He had been taught not to do so, but in practice had found no evil to result from leaving a little at bottom of a deep cavity. If such a cavity were well washed out with absolute alcohol, the leather-like remaining softened dentine must be actually hardened and dried thereby, as he had before mentioned.

Mr. COLEMAN, in reply to Mr. Sewill's question, would say, that the views he had expressed upon the nature of the discharge from an exposed pulp were the result only of his own observations. He certainly could not regard that discharge as bearing the same characters such as were considered distinctive of pus. Instead of its being a creamy, bland, and unirritating fluid, we found a thin, sanious and most offensive liquid, containing, it was true, some cells, or rather the *débris* of

cells, but certainly not in sufficient quantity to entitle it to be ranked as pus, it more closely resembled the fluids effused in humid gangrene than anything else. He wished it were pus they had to deal with, as then their treatment would be much more certain. Occasionally true well-formed pus welled up from the pulp cavity of a tooth upon removing the softened dentine; such cases he had found most easy of treatment. He had often, like Mr. Sewill, examined the pulps of teeth directly after extraction, and on their exposed surface had seen more or less the appearance of pus, but when any of the actual fluid discharged could be obtained, which was difficult, as the quantity was very small, it would, he ventured to pronounce, be found different to pus.

Mr. C. S. TOMES said, as the question of suppuration had come up, he might mention that one of their greatest authorities in Dental Pathology—viz., Professor Wedl—had mentioned the occurrence of pus on the surface of exposed dental pulps; and he should therefore be inclined to adopt the original view of Mr. Salter, as it was confirmed by so accurate an observer as Wedl. How far the existence of a few isolated pus corpuscles in a fluid stamped that fluid as pus was altogether another question. There was one point in relation to the subject of Mr. Woodhouse's paper it was very important to keep in view—viz., the exclusion of air in cases where the pulp was accidentally exposed. Suppuration they knew rarely occurred where wounds inflicted, such as the opening of a joint, for instance, occurred without any admission of air. Dr. Taft, of Cincinnati, whose skill was well known to them, was in the habit of instantly touching the pulp with nitric acid, if it were accidentally exposed, which formed an eschar, over which he at once filled, as if nothing had occurred, and probably in employing carbolic acid they did much the same thing. He believed that the great difference between the results of treatment, when the pulp was exposed by disease and when it was exposed accidentally, was, that in the former it suffered from its exposure to the air.

Mr. MOON—Mr. Woodhouse had mentioned parchment as

being the material he used for covering over the pulp : he had been lately using blotting-paper dipped in carbolic acid, with the same object. With regard to mesial or distal decay, and the great difficulty they all experienced in reaching the further canal in a molar tooth, he thought with the aid of Morrison's burning engine, it would probably be a good plan to cut up the centre with the drill instead of chiselling down off the surface. By that means they could get much more readily over the canal of the further root.

Mr. HENRY would, before the discussion closed, like to make a remark or two, as he thought his success in the conservative treatment of exposed pulps warranted him in looking forward to the time when they might renounce the practice of destroying vital dental pulps. His practice certainly pointed that way ; for in 600 teeth treated, he had only destroyed nine pulps ; and in the last 500, only three. He attributed this success mainly to the simplicity of his treatment, which to some extent was borrowed from Mr. Woodhouse's original paper on the subject. He thought the osteo-plastic stoppings were wonderful aids in the conservative treatment of the pulp. His practice, when the nerve was accidentally or even voluntarily exposed and hæmorrhage ensued, which circumstance he had never found to be any hindrance in preserving the pulp, was to stanch this thoroughly with carbolic acid, so producing an insoluble layer ; then he placed a flexible non-conductor, which precluded the possibility of any vacuum between the exposed pulp and the plastic filling. Blotting-paper had been mentioned. That he invariably used, having found that anything stouter and less flexible was more likely to be attended with failure. He used a tolerably stout blotting-paper, and preferred it to be pink, for the reason, that in difficult cavities at the back of the mouth he could adjust this so much more accurately over the point of exposure. Whenever he had met with failure, he had been able to attribute it either to exostosis or to the formation of independent nodules in the pulp. Of course he excluded from his remarks any reference to suppurating nerves, with

regard to which he fully endorsed Mr. Woodhouse's treatment. He hoped the time was not far distant when it would go forth from the Society, as the avowed object of its members, to discard the use of escharotics in the treatment of vital dental pulps ; and he thought this would redound to their credit and give greater confidence to their patients.

Mr. MUMMERY said that, whilst he regarded as invaluable, a course of treatment by which so important a structure as the dental pulp could be safely preserved, he felt it was of the utmost consequence that a correct diagnosis should be arrived at, and the treatment recommended strictly carried out. For lack of this, he had seen several cases in which a morbid secretion from the pulp had been overlooked, and much suffering had ensued. He sincerely hoped that we should never return to the system pursued forty years ago, when the patient was often told, on a tooth being filled with amalgam, that he would probably suffer pain for a few days, but that after a gum-boil had formed and suppurated, the tooth would give no further trouble. We all saw cases, occasionally, with patients of healthy constitution, where the tooth thus treated had been retained for many years, although stained black with metallic oxides. He once saw in the mouth of an aged general, a tooth which had been thus stopped sixty-six years previously, but these cases were exceptional, and the result was greatly dependent on the health of the subject. He believed the preservation of the pulp so important a point that in a few cases many years since, he had adopted the actual cautery, employing a gold wire screwed into a steel ball, which was brought to a white heat by a self-acting blow-pipe, and in one case which he had an opportunity of examining, the tooth (a central incisor), retained its natural transparency after the lapse of twenty-four years. He was, however, far from advocating this course, as it was somewhat alarming to some patients, and require favourable conditions to ensure a successful result ; and he believed the treatment by carbolic acid to be the best they were at present acquainted with, in cases of exposed healthy pulp.

Mr. HARDING — Mr. Woodhouse had told them he had been in the habit of destroying pulps ; he should like to ask him whether he had had many failures. He had admitted he had had failures in the conservative treatment—or what was commonly called the conservative treatment. So far as his experience had gone, the former treatment did not fail : it was an absolute certainty. If you could thoroughly extirpate the pulp, it was an absolute certainty that you saved your tooth ; whereas, in the other treatment, you were doing something that was liable to failure.

Mr. COLEMAN said he thought the last observation of Mr. Mummery an important one. The question of treatment by the actual cautery had never been thoroughly dealt with. He believed Mr. Harding's father had great experience in that matter, and he remembered his telling him that his success had been very considerable. He thought they would stand a great chance of succeeding in preserving a very large proportion of the pulps, if they could treat them in that way, and he believed the best way of doing it was that which the late Mr. Harding adopted, viz., by electric cautery, by which means he was able to apply a whitehot wire, which was far less painful than a red hot or blackhot. He must, however, confess that he was much surprised to hear the remark that was made by the son of that gentleman, viz., that the treatment by destruction was always successful. He continually had to remove teeth, the pulps of which had been destroyed by arsenic. The experience of a most eminent member of their Society, Mr. Tomes, quite coincided with his own, viz., that the teeth so treated might remain right for a time, but were almost invariably lost. They might be saved for several years, but to say that the operation was perfectly successful, was certainly much more than they could venture to claim for it. There was one point in Mr. Woodhouse's paper he would like to refer to, viz., the plan he adopted when he was necessitated in leaving an opening for discharge to escape through a gold filling ; he, Mr. Coleman, had employed precisely the same, excepting that he used, instead of the gold wire, iron wire, slightly moistened

with oil. He did not find the teeth so treated last many years.

Mr. HUTCHINSON said the two last speakers had referred to the cautery, and he should like to offer an idea with regard to it, which was suggested to him by the hydrogen jet evolved from zinc and sulphuric acid. If a narrow glass tube were drawn out to a very fine point, and then connected with a bottle in which zinc and hydro-chloric acid were mixed, hydrogen was given out, and it might be lighted at the top of the tube, and by that means a flame perfectly invisible was obtained, heating the point of the glass tube to a white heat. He had often thought of employing that, as it would produce an intense heat, but, from its smallness, would not cause so much alarm.

Mr. OAKLEY COLES had been continually using pepsine for the last eighteen months or more, and certainly with very great success. He not only used it in cases of exposed and suppurating or inflamed pulps, but also in the case of polypus of the pulp, and also where there was a large mass of softened, sensitive dentine, and also dentine highly sensitive but not softened. In all those cases, the pepsine seemed to act in a remarkable manner. He should be very glad if it would meet with the views of the Society, that some two or three members should be asked to take that matter in hand. He had no positive interest in it, further than to see an agent which he believed was useful more widely used.

Mr. WOODHOUSE would ask Mr. Coles how he treated the pulps which had been partly dissolved by the action of the pepsine, and he should like very much to hear what he applied as a covering to the surface of the pulps, and how they behaved under the covering.

Mr. OAKLEY COLES replied that if the exposed pulp were very sensitive, he touched it with carbolic acid in the strongest form, so as to produce an eschar; but if it were not so sensitive, he immediately stopped over it with the osteo-plastic

stopping. If he had what he believed to be a healthy pulp remaining in the pulp-chamber, and in the several fangs of, say a molar tooth, he wiped out the cavity carefully with a solution of carbolic acid and glycerine, and filled it over with osteoplastic stopping. If there were a certain amount of exudation, he believed that the action of the chloride of zinc was sufficiently antiseptic to overcome that, so as to prevent its ultimately producing alveolar abscess.

Mr. DENNANT would like to supplement the remarks of Mr. Moon, and one or two other gentlemen, as to the use of blotting-paper. He had for a long time used it as an intercepting medium, with very great satisfaction to himself. It appeared to him they should not only diagnose the actual condition of the pulp, but also the health and temperament of the patient, which he thought, perhaps, had not been quite sufficiently dwelt on in the discussion of that evening.

Mr. WOODHOUSE, in reply, said Mr. Rogers had referred to his previous paper on carbolic acid very kindly, but he thought it only fair to state how that paper came about, as it might possibly have been forgotten by some. The value of carbolic acid for their speciality was first named to him by Mr. Gibbons, and it was suggested to him by Professor Church, of Cirencester. He thought the first idea of using carbolic acid for dental purposes was from the latter gentleman. They would remember, he dared say, that the paper which he had the honour of reading before the Society in 1865 was partly contributed by Mr. Gibbons, who narrated certain of his own cases, and partly by Mr. Church, who gave the chemical history of carbolic acid. As regarded the bleeding of the pulp, he agreed with Mr. Rogers to a considerable extent. He never thought of stopping a root which was bleeding furiously. It would be very difficult to apply anything to the end of the pulp cavity while it was bleeding; whether it were tannin or carbolic acid, it would probably be washed away by the blood; but he considered that a slight oozing of blood was of little or no consequence, and at once applied the carbolic acid and cotton wool to the end of the fang, and if he was hurried he might tell

the patient to come again the next day ; and, on removing it, would find the cotton wool probably black with a little clot. The question as to the character of the discharge from the decomposing pulp was, of course, an important one, because upon the character of that discharge their treatment would a good deal depend ; but having found a treatment which was successful, he thought they need not trouble themselves so very much about its character. Mr. Sewill had spoken of the removal or non-removal of all the softened dentine as depending a great deal on the history of the tooth. He looked upon the admission that it might be desirable to leave softened dentine in a cavity as a very hazardous admission, especially to the younger members of the profession ; and it was, he feared, a dangerous heresy, to which he should be very loth to give an unqualified sanction ; but there were some few cases where it certainly might with advantage be left. If a tooth had never ached, and you found the dentine towards the pulp very sensitive, and evidently retaining vitality, though softened, it might sometimes be safely left, rather than expose the pulp by removing it. It was very interesting to him to hear that Mr. Coleman had adopted the same plan which he had in stopping teeth from which there was a discharge. He no doubt left a little duct in such cases only as could not be treated with a view to stopping that discharge. In upper molars the cavities in the external fangs were very small, so that you could not get broaches fine enough to enter them. If these were discharging, and you stopped the tooth solidly, you most certainly would have an abscess over that tooth. It was in such cases he left this duct, and he found the plan most useful. Mr. Tomes spoke of nitric acid as a cauteriser of the pulp before carbolic acid. He had tried nitric acid, nitrate of silver, and a variety of things, but they were so unsuccessful that he had ceased to use any of them ; but when he found carbolic acid he resumed his conservative treatment, and with great success. He was glad he agreed with him, that the admission of air was a very great cause of irritation. Several gentlemen had advocated the use of blotting-paper. He had used it, but preferred the parchment paper, partly, perhaps, from his old love of it. It was the

thing he first used for capping pulps so exposed, and he tried blotting-paper afterwards, but had not quite such good results, and the reason he believed was this. The parchment-paper was changed very materially in character: it was no longer paper, but was homogeneous throughout, having somewhat of the character of a gum, and was ten times as strong as the original paper; it was therefore not so easily compressed into the pulp-chamber as blotting-paper. Mr. Harding spoke of failures. They all had failures in all their theories and practices. He had never kept a regular register of his cases, but, as far as he could guess, he should say that in capping pulps of teeth which had not ached, he had had at least 95 per cent. of successes. One gentleman spoke of the constitutional conditions. Of course they had to take that into consideration, as well as other matters. In patients of a scrofulous diathesis, there was not the same tendency to heal as there was in those of a perfectly healthy constitution; but he found that in such cases teeth which had been devitalized, were very successfully treated. After long practice, one knew pretty well at a glance whether a pulp could be saved or not. The question of actual cautery had been referred to by his friend Mr. Mummery, and by others. He supposed all of them had tried it. He did at Exeter many years ago, and had done so since, but the result was so very unsatisfactory that he discontinued it. His objection to actual cautery, in the first place, was that you got all you wanted with carbolic acid. It also frightened the patient a little, but his chief objection to it was this. You had a very small opening into the pulp-chamber, which was surrounded by a hard, unyielding substance, and he thought it was extremely difficult to apply the actual cautery to all portions of that exposed pulp under those conditions. If you left the slightest portion unacted upon, that would remain a point of irritation, and the result would certainly be a failure. If the actual cautery were employed, he thought the platinum wire in connection with the galvanic battery was the thing to use. He was pleased to hear Mr. Oakley Coles's description of the treatment of pulps with pepsine. He had not himself used osteo in actual contact with the pulp. He had heard very

varying accounts of the results. Some practitioners asserted that if osteo were placed on an exposed pulp it was certain to destroy it: others said that it cauterised it, and left it in a healthy condition. Mr. Oakley Coles seemed to have had the latter experience.

The CHAIRMAN said:—I have listened with great attention and very great pleasure to the valuable paper Mr. Woodhouse has favoured us with, and I feel persuaded we all appreciate the great pains and labour he has bestowed upon it. To him our very best thanks are due, as are they also to Mr. Sewill, Mr. Looker, Mr. Brunton, Mr. C. S. Tomes, and the respective donors to the Library and Museum.

On the occasion of bringing the first part of our session for this year to a close, and before parting for a short period, to meet again on the 2nd of November, with, I sincerely hope, recruited health and energy, and no diminution in our number, it is my pleasing duty to make a few remarks.

And first let me thank *you*, gentlemen, *generally*, for the unvarying courtesy and attention you have shown me since I have occupied the position—the proud position—of President of the Odontological Society of Great Britain, and which have gone so far towards relieving me of many of the doubts and misgivings I may have felt on being called to fill a post so important as to make most men feel diffident, in some degree, upon assuming its occupancy; and then, *individually*, those of you who have contributed papers, which have been heard with such deep interest, and which, I am certain, have contributed in no small degree to the furtherance of a science, which so largely affords relief to suffering humanity.

You may remember, gentlemen, that, in my inaugural address to you, I defined our calling as an Art, as much as a Profession; and, looking back upon the few months during which I have occupied this chair, I feel that not alone am *I*, as your President, and *the Society* of which you are members, to be congratulated upon the manifest spirit of progress, and the vast surgical and mechanical skill and experience exhibited in the papers which have been read, but also the *general*

public, that a profession so absolutely indispensable to the public welfare and comfort should number among its votaries men who work, as great artists always do, as much for the love of their art as from any other motive.

I have been almost tempted to forget a certain maxim which is peculiarly applicable to occasions of the kind at which we are now present.

“Brevity,” gentlemen, has been most truly said to be “the soul of wit”; and I feel that to trespass further on your patience would directly militate against any notions you may have formed as to my sagacity, especially at a time when “we do but part to meet again.”

Therefore, gentlemen, I will bring to a close my present valedictory remarks to you, merely asking you to remember the aphorism of the celebrated Roman poet,—

“Dulce est desipere in loco ;”

and expressing my sincerest hope that “playing the idler,” which he so epigrammatically commends, will be a period of relaxation—necessary, of course, to all—which will prove of the utmost benefit, not only to yourselves, but also to the companions of your leisure hours.

Gentlemen, I bid you a temporary farewell, and thank you for the kindness with which you have now, as always, listened to me.

The proceedings then terminated.

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